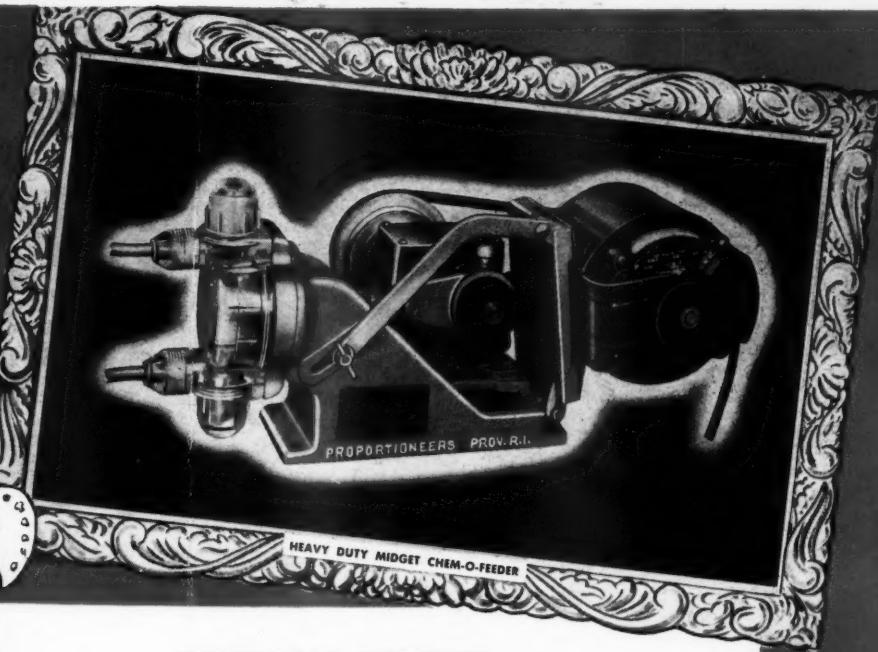


MARCH
1946

IN THIS ISSUE:
Methods of Disposing
of Sludge
Cross-Connection
Practices
Airports and Highways
Grounds Maintenance

Public Works

Portraits of a
Dependable
Chemical Feeder



DESCRIPTION

The Heavy Duty Midget Chem-O-Feeder is a constant rate-of-feed, diaphragm pump equipped with a "See-Thru" plastic reagent head and driven by a 1/6 h.p. 1750 RPM electric motor. The feeding rate is adjustable by means of a duplex eccentric cam regulating the stroke length and by shifting the belt in the three-step cone pulley for adjusting the stroking speed.

SPECIFICATION:

Stroke length: adjustable from .05 to 0.2".

Delivery per stroke 1.5 CC to 10.6 CC.

*Stroking rate: 13, 26 and 48 strokes per minute.

Reagent delivery: Approx. 19.5 to 509 CC per minute — *0 to 8 gallons per hour at atmospheric pressure — *0 to 7.4 gallons per hour at maximum pressure of 85 lbs.

* Based on use of 1750 RPM motor and 50 to 1 speed reducer. Increased capacities can be obtained by using lower ratio speed reducer.

CHEMICALS HANDLED

Calcium and Sodium Hypochlorite • Calgon • Sodium Phosphate • Aluminum Sulphate • Aqua Ammonia Sodium Carbonate • Lime Slurry • Carbon Slurry Ferric Chloride • Etc.

TYPICAL USERS

Town of Arab, Alabama • Peoples Water Service Co., Church Pt., La. • U. S. Naval Air Sta., Pawtuxent River, Md. • Sparkletts Water Co., Los Angeles, Calif. Town of Walden, Colorado • Town of Lytton, Iowa Town of Ware, Mass. • Belgrade Water & Power Co., Belgrade, Me. • City of Chicago, Ill. • City of Crystal Springs, Miss. • City of Hiawatha, Kansas.

SHIPPING INFORMATION:

Net weight 72 lbs.

Gross weight 105 lbs.

Box size 13" x 16" x 29"

Shipment 1-3 weeks

% PROPORTIONEERS, INC. %

96 CODDING STREET, PROVIDENCE 1, RHODE ISLAND

Better Trucks for YOUR Business!



TRUCK-ENGINEERED • TRUCK-BUILT • BY TRUCK MEN

"VERY HAPPY THAT OUR AMBULANCE IS ON A FORD CHASSIS"

When public-spirited civic organizations of Clinton, Iowa, aroused by the grave need for a public emergency ambulance, purchased one a year ago and presented it, fully equipped, to the city, Mayor William N. Judd wrote the local Ford Dealer through whom the new ambulance was procured:

"The presentation of the ambulance shows how much these patriotic organizations are doing toward betterment of our community and the nation. And, because we know what Ford products are, we are very happy that these organizations selected and put this ambulance on a Ford chassis."

In hundreds of American municipalities, this same high esteem for Ford Trucks and Ford Cars is evident, year after year, in continued use of Ford equipment in almost every phase of town and city operation involving motor transport.

Refuse hauling, park and street work, fire and police protection, all highlight the well-recognized truism, "The choice of Ford equipment is one of the surest, as regards universal taxpayer approval."

There is a proper Ford chassis for 95 per cent of all hauling needs.



ADVANCED ENGINEERING IN NEW FORD TRUCKS

*More Economy and Endurance
Easier Servicing*

A STILL GREATER 100 HP V-8 ENGINE with NEW Ford steel-cored Silvaloy rod bearings, more enduring than ever in severe service • NEW aluminum alloy cam-ground 4-ring pistons for oil economy • BIGGER, more efficient oil pump and IMPROVED rear bearing oil seal • NEW longer-lived valve springs • NEW improvements in cooling • NEW efficiency in ignition • in carburetion • in lubrication • in ease and economy of servicing operations • And available in all truck chassis except C.O.E. units—the rugged, thrifty 90 HP FORD SIX-CYLINDER ENGINE, with many important advancements.

FORD CHASSIS ADVANTAGES: Easy accessibility for low-cost maintenance • Universal service facilities • Tough, forged front axles • Extra-sturdy rear axles with pinion straddle-mounted on 3 large roller bearings, $\frac{3}{4}$ -floating type in light duty units, full-floating in all others • 3 axle ratios available (2 in 1-ton unit) • 2-speed axle available in heavy duty units at extra cost • Powerful hydraulic brakes, large drums, cast braking surfaces • Rugged 4-speed transmission with NEW Internal reverse lock optional at extra cost on light duty units, standard on all others.

FORD TRUCKS

MORE FORD TRUCKS ON THE ROAD • ON MORE JOBS • FOR MORE GOOD REASONS

SOVED

TOUGH SEWAGE PROBLEMS

....through intensive engineering application

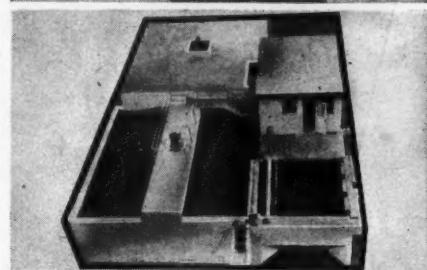
SCREENINGS HANDLING AND DISPOSAL

Comminutors eliminate screenings handling and disposal by burial or incineration, the worst nuisance in sewage plants. Sewage solids are automatically screened and cut under water in the inlet channel. Comminuted solids settle in the primary tank and are pumped to the digester. Over 1,200 installed since 1933. Ask for Bulletin 185.



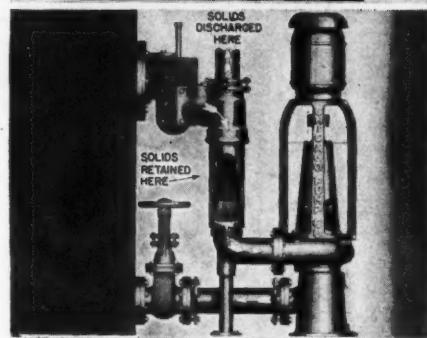
"PACKAGE" SEWAGE PLANTS

The problem of complete sewage treatment for small communities has been solved by Chicago "Package" Plants. They are low in cost, simple to operate, odorless, and produce a sparkling clear effluent. Over 100 installed since 1936. Ask for Bulletin 128-K1.



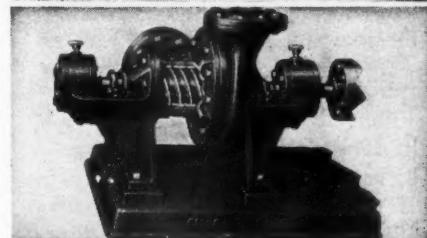
PUMP CLOGGING

"Flush-Kleens" eliminate pump clogging, because sewage solids do not pass through pump impellers. Over 3,000 installed since 1924. Ask for Bulletin 122.



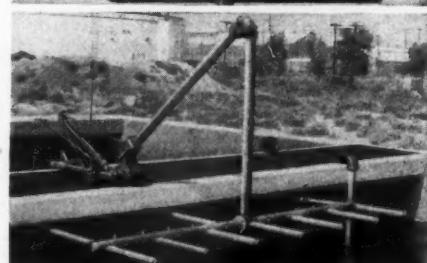
PRIMARY SLUDGE PUMPING

The Scru-Peller, a centrifugal pump with cutting screw feed. Pumps primary sludge as easy as clear water. Over 600 installed since 1934. Ask for Bulletin 190.



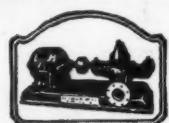
ACTIVATED SLUDGE CONTROL

Chicago Wide Band Air Diffusion System with Swing Diffusers provides positive control of the Activated Sludge Process for consistent complete sewage treatment. The diffuser tubes can be raised to the tank walk for rescaling and easy maintenance without interrupting operation or draining the aeration tank. Over 100 installations since 1936. Ask for Bulletin 175.



CHICAGO PUMP COMPANY SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET



CHICAGO 18, ILLINOIS

Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.



An aerial gravity line was indicated as the best means of transporting sewage across this river and into the main trunk sewer. And the engineers selected **ARMCO** Asbestos-Bonded Pipe for these important reasons . . .

This sturdy corrugated pipe has ample beam strength for aerial suspension. Corrugated coupling bands join long sections — assure a tight joint as strong as the pipe itself. There are fewer joints to connect and, thanks to the light weight of Armco Pipe, even the longest lengths are easy to handle and install. Temperature changes are no problem because

Armco Pipe absorbs expansion and contraction without special fittings.

For severely corrosive conditions, a full bituminous coating is tightly bonded to the base metal. Erosion is checked by a thick bituminous pavement that makes the bottom last as long as the top.

Underground, as well as in the air, you will find that **ARMCO** Asbestos-Bonded Pipe can solve many of your most vexing sewer problems. It withstands destructive vibration under highways and railroads, spans unstable or wet foundations, and can be placed in the deepest trenches. Where necessary this time-proved pipe can

be jacked under busy streets without disturbing pavement or traffic. Write today for the Armco Sewer Book. Armco Drainage & Metal Products, Inc., and Associated Companies, 1375 Curtis Street, Middletown, Ohio.

★ ★ ★

Supported by cables and brackets attached to a railroad bridge, ARMCO Asbestos-Bonded Pipe provides safe passage for sanitary sewage. The span is 1700 feet long and 100 feet above the river. Installation time was only 14 days.



ASBESTOS-BONDED

Armco Sewer Pipe





HYDRANTS

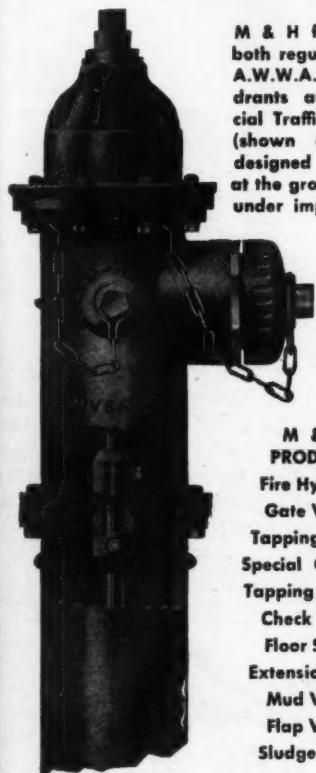
and

VALVES

Expert workmanship and highest quality materials make M & H products a good investment always. Many years of use in all sections of the country has proved their ruggedness and dependability.



M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model (shown at left) designed to yield at the ground line under impact.



**M & H
PRODUCTS**
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes

Write for Catalog No. 34

**M & H VALVE
AND FITTINGS COMPANY**

ANNISTON, ALABAMA

PUBLIC WORKS

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 77 No. 3

W. A. HARDENBERGH and A. PRESCOTT FOLWELL
Editors

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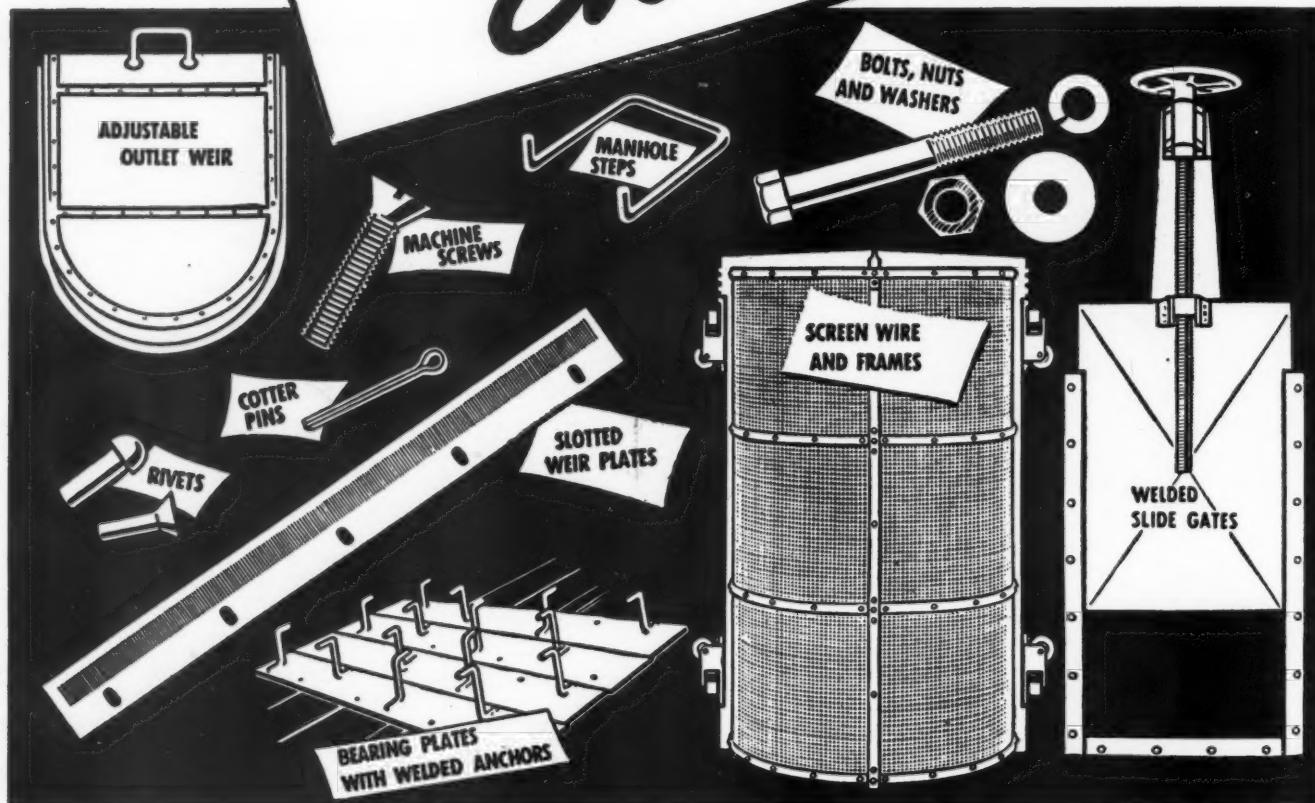
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Light weight...Long life
Combined in equipment of
Everdur



HIGH STRENGTH, good welding characteristics and corrosion resistance equal to that of copper...this is the useful combination of properties offered by Everdur*. Because of these properties, Everdur is widely used for sewage treatment and waterworks equipment of light weight or welded construction. The durability of Everdur under corrosive conditions is attested by installations still giving dependable service after 18 years.

Available in practically all commercial shapes, Everdur Copper-Silicon Alloys are readily fabricated. For detailed information, write for Publications E-11 and E-6.

*Reg. U. S. Pat. Off.

46211

EVERDUR is widely used for:

Coarse and Fine Screens, Float Chambers, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Pipe, Ladders, Float Gage Chains, Valve Springs, Guides, Walkways, Electrical Conduit, Flashboard Supports, Flush Box Fittings, Spillway Fittings, Valve Stems.



Everdur
COPPER-SILICON ALLOYS

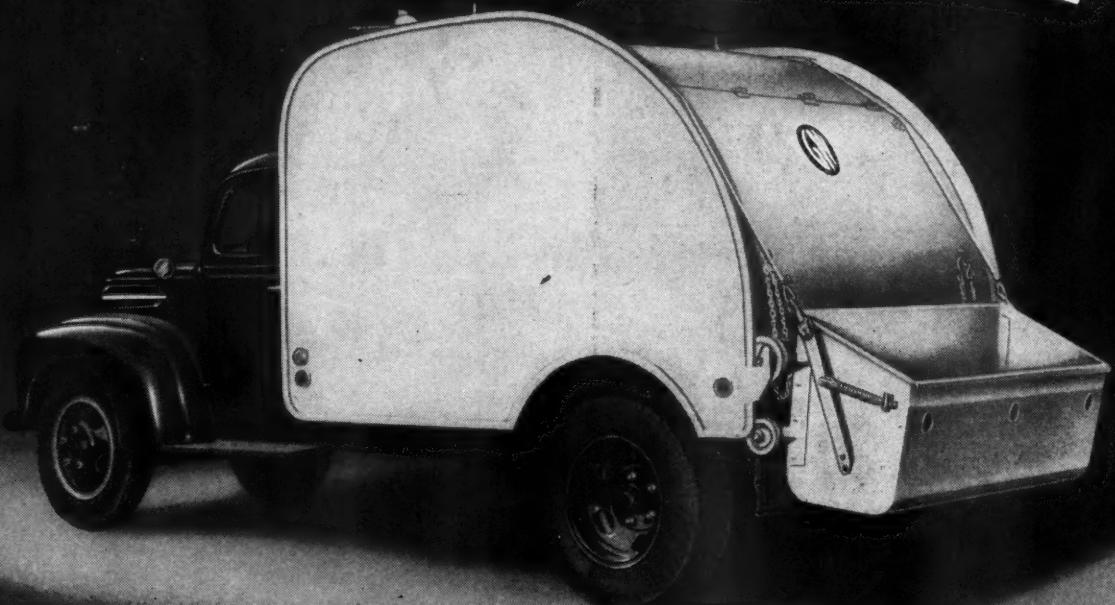
THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

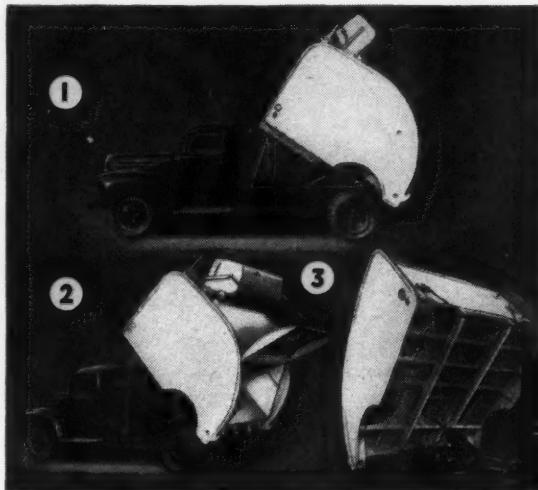
Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
 New Toronto, Ont.

Presenting the
GAR WOOD *Bucket Loader*



THE NEWEST in SANITARY REFUSE COLLECTORS



... takes its place in the famous line of GAR WOOD Municipal Equipment

The Bucket Loader, another Gar Wood achievement, was designed to meet the ever increasing need for an all enclosed, sanitary refuse collection unit to handle wet garbage, ashes, sweepings and other non-compressible refuse.

Because of its design features—its low cost and ease of operation, the Bucket Loader is an outstanding unit for municipalities and private operators.

GAR WOOD INDUSTRIES, INC.,
 HOIST AND BODY DIVISION
 7924 Riopelle Street
 Detroit 11, Michigan
 Please send Bulletin BL1 which fully describes the new Gar Wood Bucket Loader.

Name.....
 Address.....
 City..... Zone..... State.....

1 As body is raised, loaded bucket travels simultaneously to top of body—hatch cover automatically opens and closes. 2 With body elevated to 50° and tailgate opened, the load slides free. Easily kept clean.
 3 Solid, welded steel body understructure. Hydraulic hoist and cable mechanism.



GAR WOOD INDUSTRIES, INC.

DETROIT 11, MICHIGAN

WORLD'S LARGEST MANUFACTURERS OF TRUCK AND TRAILER EQUIPMENT
 OTHER PRODUCTS: Hoists • Bodies • Winches • Cranes • Tanks • Road Machinery • Heating Equipment • Boats

WHERE and HOW to in installation, operation and m



When you need special information—consult the classified READER'S SERVICE DEPT., pages 69-71

JOHNSMANVILLE
JM
PRODUCTS

ASSEMBLY
The S
stay a
stay t
flecto

Jo

to REDUCE COSTS

and maintenance of water lines

FROM its low initial installation cost to its far-reaching economies over the years . . . in both water transmission and distribution lines . . . TRANSITE PRESSURE PIPE can save you money.

Made of asbestos and cement, this modern pipe can't tuberculate . . . is highly resistant to soil corrosion. Easily handled and installed,

it maintains high delivery capacity . . . forms tight yet flexible joints. It is used by thousands of communities all over the country because it provides more efficient, more economical water transportation year after year.

For complete information, write for brochure TR-11A. Johns-Manville, 22 East 40th Street, New York 16, N. Y.



TRUCKING COSTS hit bottom with Transite! Its light weight means more footage carried per truckload—time and money saved in transporting this pipe to the job.



HANDLING COSTS too, are low. Fewer man-hours are required for unloading and lowering into the trench. Only the larger sizes require mechanical handling equipment.



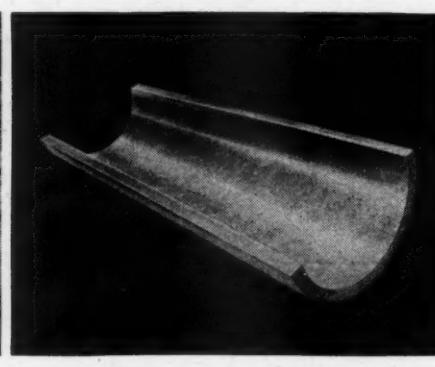
EXCAVATING COSTS, as shown above, are low with Transite. Trenches are narrow and disturbance to pavement is kept to a minimum. No bell holes are required at the joints.



ASSEMBLY COSTS drop with Transite. The Simplex Coupling permits quick, easy assembly . . . assures joints that stay tight, even when the line is deflected as much as 5° at each coupling.



MAINTENANCE COSTS are cut with Transite. Its tight joints, high uniform strength, proven durability and corrosion-resistance all contribute to its economical performance.



OPERATING COSTS stay low because this asbestos-cement pipe cannot tuberculate. As a result, its delivery capacity (C-140) remains high; pumping costs are minimized.

Johns-Manville TRANSITE PIPE

PUBLIC WORKS Equipment News

International 130 h.p. Diesel Crawler Tractor

A new diesel crawler tractor in the 130 drawbar horsepower range is the latest addition to the International line. The TD-24 weighs approximately 35,000 pounds and is the largest tractor ever built by the company.

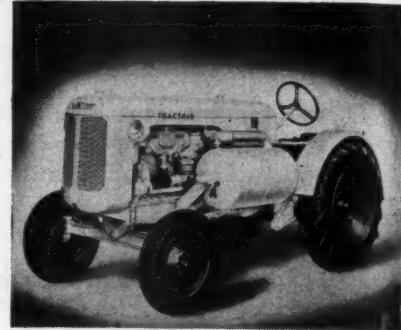
Features of the new tractor include a new type of steering, giving the operator easy and positive control of the tractor; use of special sealing and anti-friction bearings in track rollers, greatly extending the track roller lubrication period; and convenient mounting for all types of allied equipment. The TD-24 is streamlined, giving the operator a clear view of mounted equipment and of work in all directions.

The TD-24 is designed with a horse-

separation operations. While not perceptible to the eye, its movement or stroke is actually "upward, forward and back" momentarily leaving the material suspended, then repeating this movement 3600 times per minute. Thus some impact is occasioned between the material and the grizzly bars which, while slight, is of sufficient force to tumble the material and hasten separation. A catalog giving detailed capacity and layout specifications is available upon request.

A Most Useful Air Compressor

Le Roi, Milwaukee has announced a most useful new portable air compressor. This unit called "Tractair," is a 105 c.f.m. air compressor combined as an integral part with a 35-hp.

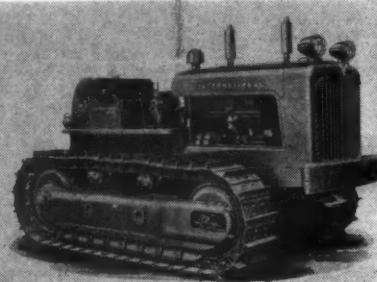


Le Roi Tractair Compressor.

tractor and in addition maintain a full head of compressed air. The Tractair brings compressed air power to job locations heretofore inaccessible to any power equipment. Numerous front and rear pneumatic, hydraulic, and mechanical attachments are available to further increase the usefulness of this new product.



International Harvester TD-24 diesel tractor at right, 150 h.p. Left, an 1D-6 wheel tractor and hydraulic shovel on a sewer backfilling job in Los Angeles.



power-to-weight balance which ensures a high percentage of engine horsepower delivered at the drawbar. Eight speeds, from 1.6 to 7.8 m.p.h., give great flexibility. A new International six cylinder, full-diesel engine is used. This engine has a built-in gasoline starting system which, with an electric starter, assures easy starting in all weather conditions.

Vibratory Screening Grizzlies

Syntron Company, 660 Lexington Ave., Homer City, Pa., announces a large capacity, heavy-duty screening-grizzly feeder. The Model F-45 Feeder shown has an actual conveying capacity of 200 tons per hour, but for separation purposes, this capacity varies with the percentage of fines discharge required by the user. In a particular case, the grizzly handled 65 tons per hour of run-of-mine clay to a crusher, taking out fines of $1\frac{1}{2}$ " and under. By using a heavier-duty magnet, or a combination of magnets, capacities of up to 500 tons per hour can be obtained.

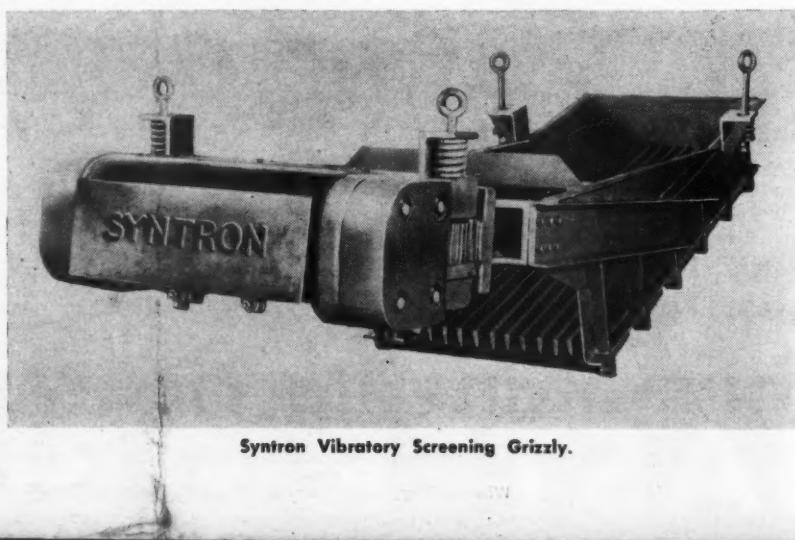
The vibratory action of Syntron Feeders is particularly adaptable to

wheel tractor. The air-power unit is entirely new, with 6 cylinders, utilizing all of the latest developments in industrial engine design. The tractor unit is a Le Roi-Centaur mounted on 4 pneumatic tires, with five-speed transmission. The unit can be operated as a compressor yet maintains full utility of the tractor. Power surplus of the engine is adequate to permit use as

Exposure Calculator for Photocopying

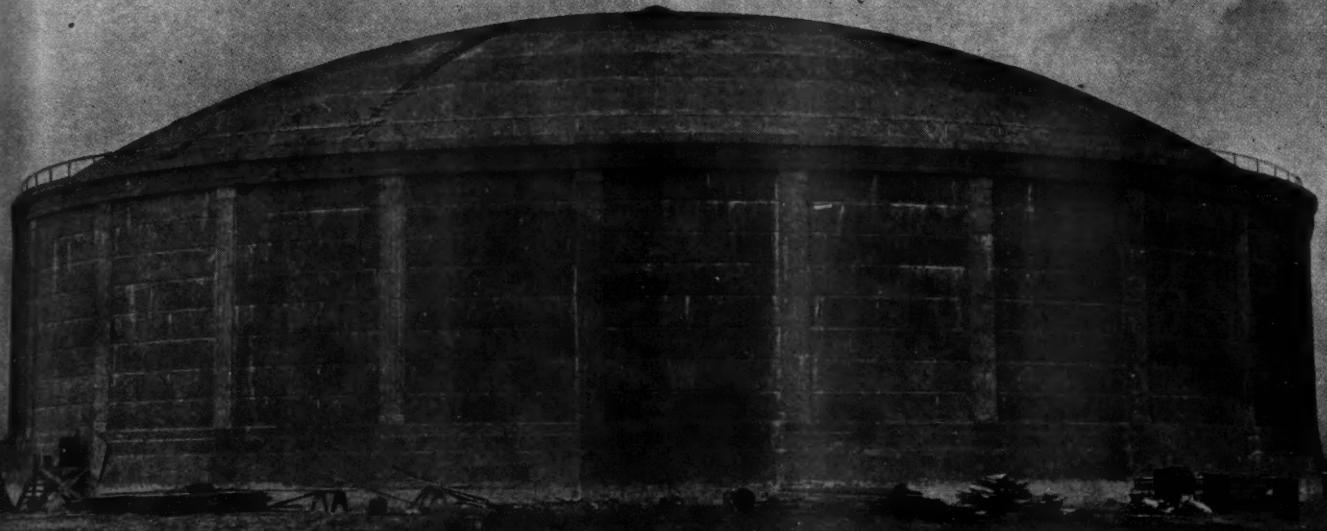
A simple exposure slide, enabling the operator of a photocopying machine to calculate in an instant the proper exposure time for anything he wants to copy, has been developed for the first time, by the American Photocopy Equipment Company, 2849 No. Clark St., Chicago, Ill.

The slide, which is now being distributed to owners of Apeco Photocopy equipment, measures approximately six inches long and three wide, and holds a movable chart whose figures appear through slots on the front face of the rule. Exposure time is given for five types of reproduction: namely, positive; and reflex, reverse, alternate and readable negative. These exposures apply



Syntron Vibratory Screening Grizzly.

Tested To Full Capacity . . . No Leaks Appeared!"



Falls, Minnesota Water Storage Tank
Arch. Eng. & Archts. — Consulting Engs. — 3000,000 gal.
Arch. & Eng. — C. C. C. — Contracting Engs. — 3000,000 gal.
Arch. & Eng. — C. C. C. — Contracting Engs. — 3000,000 gal.

Two-Way Prestressed POZZOLITH Concrete Water Storage Tank

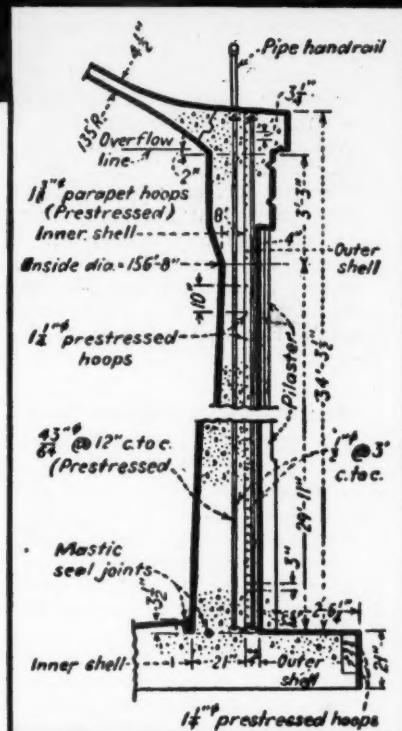
ADVANCED engineering design and advanced concrete design — using Pozzolith cement dispersion — provided complete watertightness in this immense reinforced concrete tank . . . probably the largest in the world above ground.

Pozzolith, specified also for greater durability, produces all the benefits of air entrainment with increased strength and at lower cost.

This is proved by the results of tests by the Nation's top testing authority, and has been testified to by the use of Pozzolith in millions of yards of concrete.

Write for complete information today.

THE MASTER BUILDERS COMPANY
CLEVELAND 3, OHIO • TORONTO, ONTARIO



" . . . the tank was tested to full capacity and no leaks appeared, even before applying a coating of asphaltic waterproofing on the floor and inside face of wall."

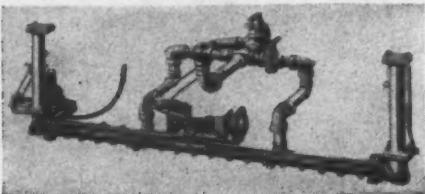
Eng. News Record, Oct. 4, 1945, page 108.

MASTER  **BUILDERS**

to documents ranging all the way from original tracings on very thin paper to newspapers, photographs and blueprints, etc.

New Cartwright Hot Spray Bar

Many advanced features of construction and design are claimed for the new Cartwright hot spray bar, for distribution of bituminous materials. This new bar is of double construction, with an inner pipe which carries the material to the ends of the bar, from



Cartwright Hot Spray Bar.

which points it circulates back through an outer pipe and on out the spray nozzles or back into the supply tank.

This full circulation throughout the entire length of the bar, no matter in what position the end sections may be, is made possible by a patented joint construction where the end sections of the bar are joined to the main section. Also, the end sections will swing free in case they should hit a solid obstruction from either the front or rear. Valves are located in the spray nozzles, giving instantaneous "full-on" or "shut-off" control without drip.

The Cartwright hot spray bar can be attached to any distributor. It is available in several different lengths. Complete information can be obtained from the manufacturer, The Cartwright Asphalt Equipment Company, North Robinson, Ohio.

Foote 34-E Dual Drum Paver

The Multi-Foote Duomix, a 34-E dual-drum paver, has fully automatic control to cut, charging, transfer, and discharging time to a minimum. On one pilot test which involved paving of a six-mile reconstruction project, the paver turned out 10% oversize batches (37.4 cu. ft.) every 35 seconds. Whenever enough batch trucks were available, runs ranging from 60 to 80 batches an hour were made despite the necessity of moving the paver back and forth in order to put on a final three-inch top course after placing reinforcement.

Transfer and discharge chutes are rotary type, requiring only a quarter turn from completely shut to wide open positions. Drums are both of the double-cone design. Unusually smooth operation results from careful weight distribution and balanced overall design.

The original pilot model of the Duomix 34-E laid approximately 45,000 cubic yards of concrete in completing its first test without any time out for repairs, or for alterations in the original design. Full data from Foote Co., Inc., Nunda, N. Y.

Flexible Coupling Power Take-Off for Any Truck

This new type of power take-off slips in the space between the transmission and the transfer case. It is compact, easily installed and light in weight, and allows full normal use of the truck in every respect; air compressors, pumps, winches or other equipment can be operated. It will operate with the truck in motion. There are three working or shift positions: (1) truck drive for normal road operation; (2) truck drive and power take-off, both engaged; (3) power takeoff only, with truck stationary. Information on this and other handy products from Couse Mfg. Co., Newark 4, N. J.

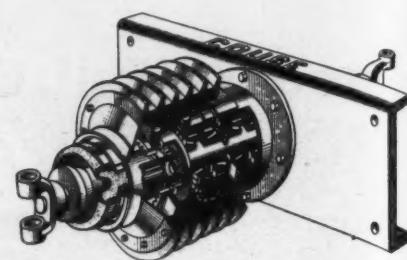
Safety Equipment

A new and complete 178-page catalog has been published by Mine Safety Appliances Company, describing and illustrating a complete range of safety equipment for industrial application, including many new products. The regular edition of the 6-B Catalog is in its usual 8½" x 11" size. Also available is a new, handy, pocket-size edition of this catalog 5" x 6½", containing the same material and number of pages as the large edition, but in the miniature size. Copies may be secured from PUBLIC WORKS or from Mine Safety Appliances Company, Pittsburgh 8, Pa.

New Completely Portable Greasing Unit

Flexible, economical operation—no electric cord or air hose is required. Unit delivers up to 12,000 lbs. steady, consistent pressure which is instantly available to clear the most obstinate channel stoppages and effect complete lubrication of parts. Pressurelube units eliminate trouble with frozen shackle fittings and other common problems. The latter feature provides "safety operation."

Complete portability provides "on the spot" lubrication—trucks, trailers, tractors, steam shovels, airplanes, rolling stock of all description may be



Couse power take-off unit.

serviced on the job without removing load. High efficiency—even in zero temperatures—speeds production, reduces operating stoppages. Units are a product of Pressurelube, Inc., 609 West 134th St., New York 31, N. Y.

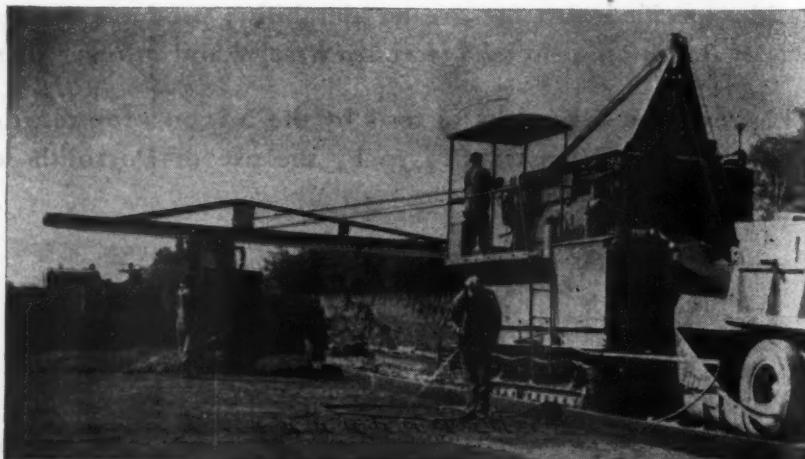
Street Lighting Control Operates on North Light

An electronic "Sun Switch," designed to control street lighting, is announced by the Ripley Company, Torrington, Conn. This unit will control street lighting service to insure required illumination regardless of fluctuations in weather conditions and the twilight hour. It will permit installations on each light pole, thus eliminating heavy investment in series circuits and operating costs due to storm hazards.

Under usual conditions the control provides a minimum "lights on" period from 25 minutes after sunset to 25 minutes before sunrise and adjustment is provided to meet customers' specific requirements. A bracket and the shape of the housing permits direction of the photo-cell of each unit to north light without interfering with the installation. The "Sun Switch" can also be used for the control of lighting of public buildings, airports, outdoor advertising, etc.

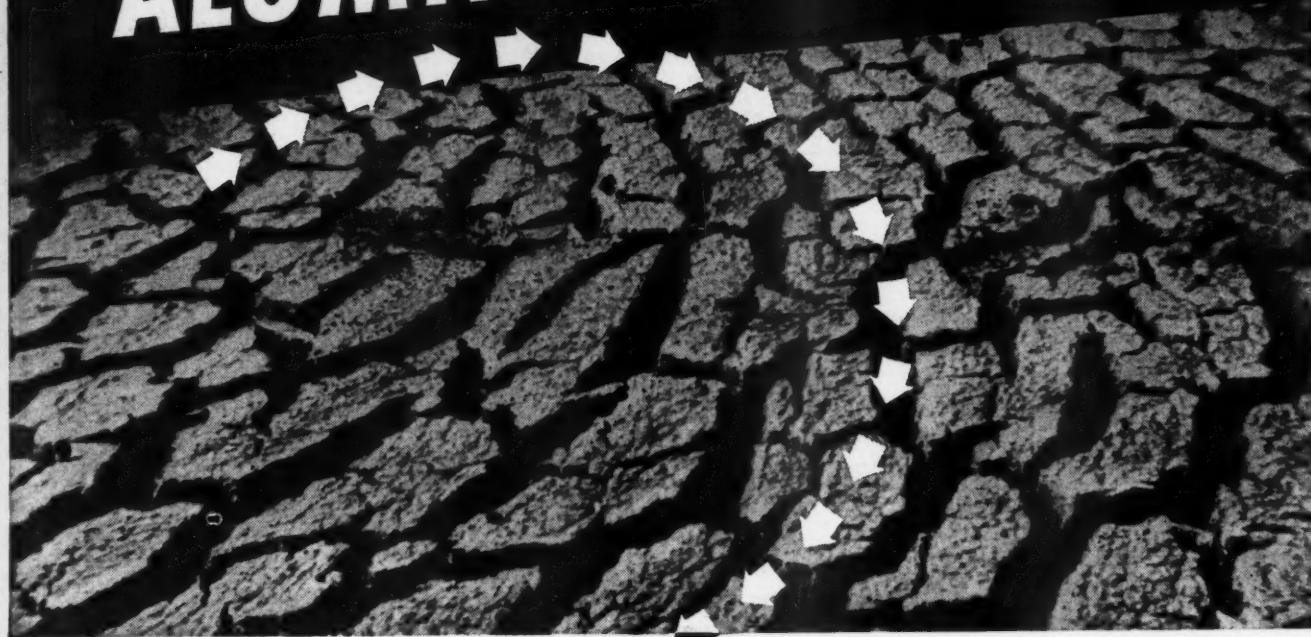
Independent Power Supply for Paving Finisher

Portable electricity will simplify and help speed postwar construction of paved highways. An Onan Model W38 portable electric unit was installed on



New Foote 34-E Dual Drum Paver.

GENERAL CHEMICAL ALUMINUM SULFATE



Well cracked sludge bed shortly after Aluminum Sulfate treatment.

SPEEDS SLUDGE DRYING

General Chemical Alum speeds sludge dewatering and drying on sand beds . . .

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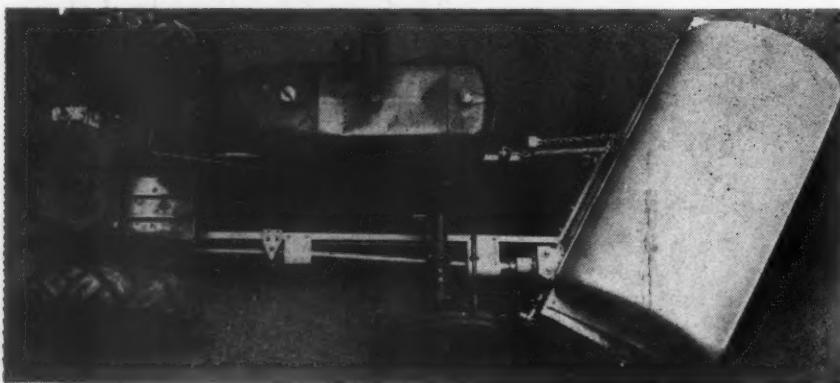
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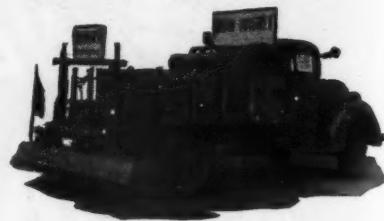
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View from above of
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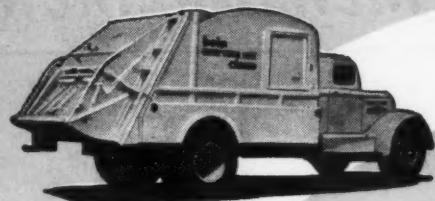
Lake Chemical Co., 607 N. Western Ave., Chicago 12, Ill. announces "Pipetite-Stik," a pipe joint compound in handy, clean, easy-to-use stick form. All that is necessary is to rub the stick 3 or 4 times across the threads. It spreads and fills threads when turned. The stick is encased in a convenient cardboard holder for easy carrying.



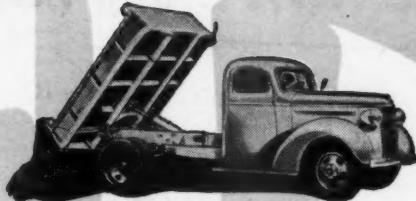
Pipe Compound Stick.

The manufacturer says this new compound withstands gasoline, oil, butane, propane, Freon, air, water, steam, acid, gas, brine, sulphur dioxide, etc; that joints can be disconnected easily years after applying; that it lubricates and completely seals pipe joint threads, nuts, bolts, gaskets, turnbuckles, etc; it cannot flow into and clog even the smallest size pipes; it withstands vibration, temperature changes, deflection and pressure; joints can be remade without having to clean the threads; and it prevents rusting.

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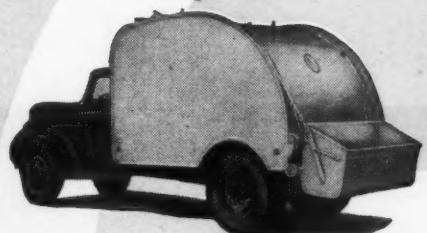
The Load Packer (patented) all enclosed garbage and refuse unit. Compresses loads hydraulically.



Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.



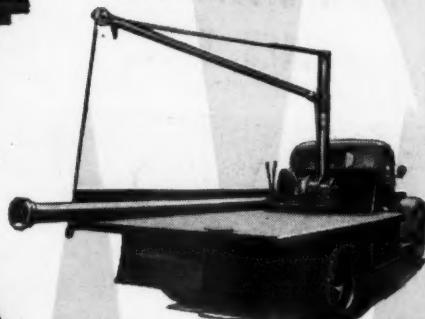
Repair Tower, two sections, insulated platform.



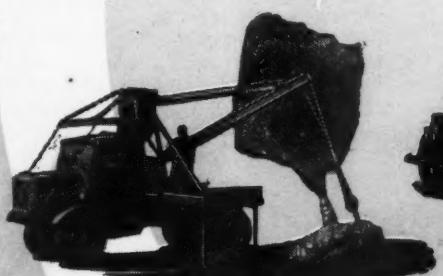
The new Bucket Loader, an all enclosed sanitary refuse disposal unit.



Telescopic boom Crane. Boom radius 8 to 20 feet.



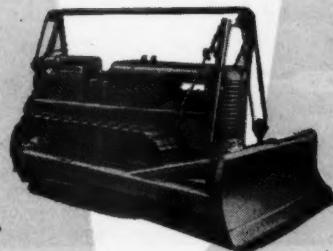
Crane Model 916 with Winch—also available with Dump Body.



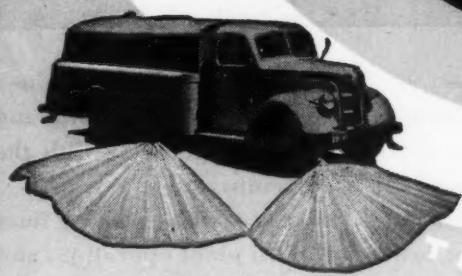
Crane Model 4812 for heavy park-way work.



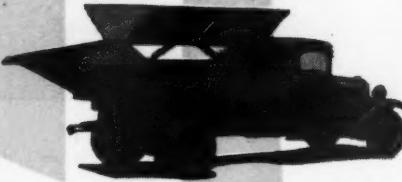
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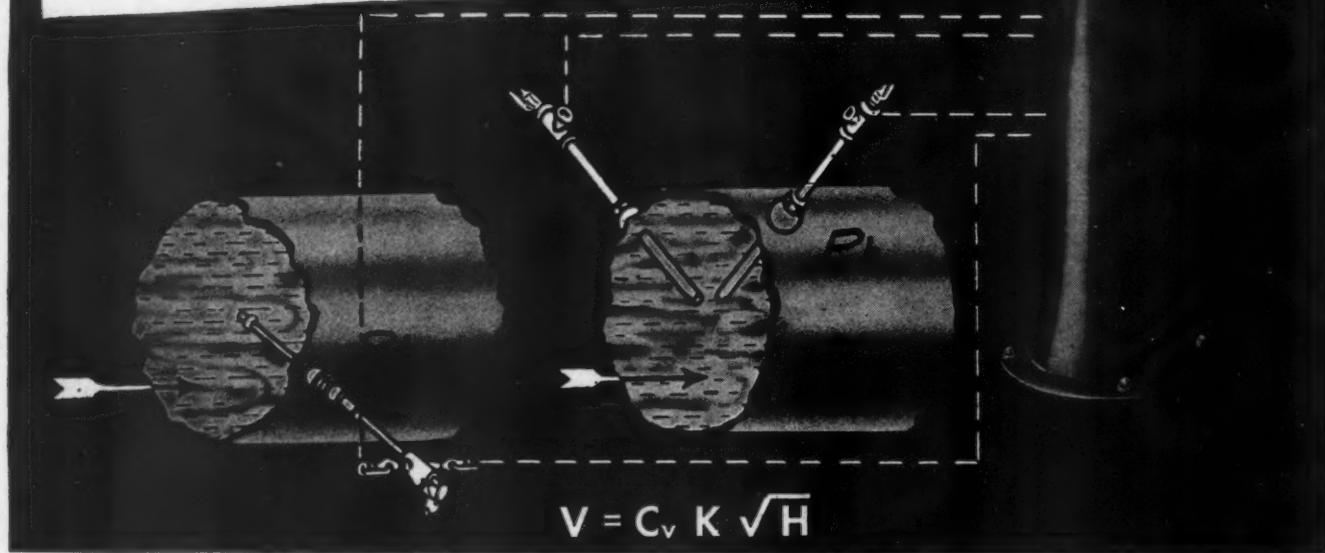
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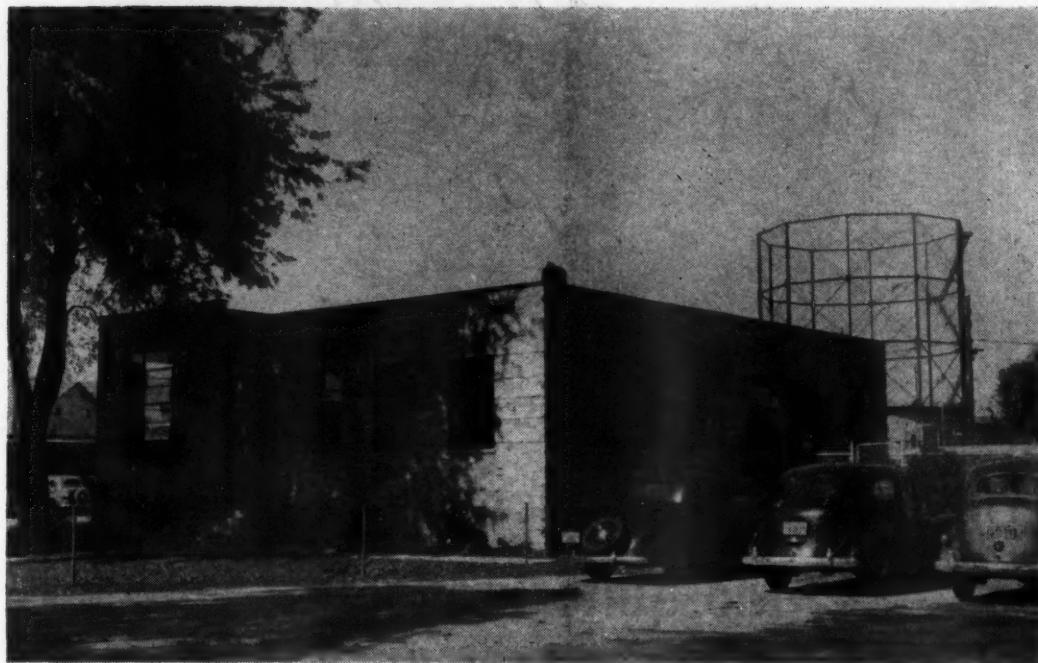
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PUBLIC WORKS MAGAZINE . . . March, 1946

VOL. 77. NO. 3



The Ithaca Sewage Plant, Pump Station and Laboratory.

Cleaning a Digester

Settlement of digester, because of unstable foundation, allowed grit to collect in the bottom, necessitating drainage of the tank and removal of the deposit. Methods of procedure are described.

GEORGE D. CARPENTER
Supt. of Water and Sewers, Ithaca, New York

DURING the late autumn of 1944, one of the Ithaca sewage plant operators dropped a 6-inch cast iron plug through the manhole in the top of the first stage digester, stalling the scraper mechanism, and making it necessary to empty the digester to remove the plug. When the tank was emptied, it was found that there was a considerable accumulation of grit and hard grease on the bottom which could not be flushed out. Unusual means were used to clean out this material, as will be described.

The Ithaca plant is a conventional primary sewage treatment plant, consisting of mechanically raked screens; a screenings grinder mounted so as to drop the ground screenings back into the sewage flow; sewage pumps drawing from a wet well; primary tanks with longitudinal scrapers, with the flights arranged to return on the surface to act as grease skimmers; and two-stage digestion followed by sludge drying on

glass covered beds. Gas from the first-stage digester is collected in a gas holder covering the second-stage tank, and the gas is used for pumping and heating purposes. The sewage is chlorinated during the recreation season. Although the sewer system is supposed to carry only sanitary flows, it apparently picks up a considerable storm flow, as evidenced by a great increase in volume during storm periods. Street washings certainly find their way into the sewers, for appreciable quantities of cinders and other grit are apparent at times. The plant is not equipped with any device to remove grit, and in fact the plant structures are laid out so as to avoid pockets where grit could collect. This being the case, all grit entering the plant finds its way eventually to the first-stage digester.

Grease, which is skimmed toward the outlet end of the primary settling tanks, is collected in a grease

(Continued on page 32)



Construction roads in wet ground, or in rainy weather, provide unexampled opportunity for mosquito breeding. Regular use of a blade grader to eliminate the ruts is the best preventive.

Highways and Airports as Malaria and Mosquito Producers

Improperly placed culverts, poorly graded roadside ditches, blocked drainage and careless construction practice can result in heavy mosquito production. Good highway and airport drainage practice will usually prevent mosquito breeding.

IT is not far from the truth to state that road and airport builders, during the war just ended, were responsible for the production of more malaria mosquitoes than was Mother Nature herself. In the campaigns on the northeast coast of New Guinea, six to eight soldiers were evacuated because of malaria to each battle casualty. Along the West African coast, the malaria rate was excessively high. Not all of this malaria was due to construction activities, but a good deal of it was. It was a common remark in the Southwest Pacific that there were never many mosquitoes until construction began.

Road ruts, the general practice of construction men to start a new road on slight provocation, borrow pits, and blocked drainage were the principal causes of excessive mosquito breeding. Around Rufisque Field at Dakar, French West Africa, the terrain had a truck or tractor rut every 30 to 50 yards, in some areas, and in the wet season every rut produced malaria mosquitoes. This tendency of construction men never to follow an established road had at least something to do with a malaria rate of 2 or 3 cases per man per year. The utmost efforts of Malaria Control Units could not keep up with mosquito production in such cases.

In the United States, a great deal of malaria has resulted from the carelessness or ignorance of highway builders and engineers; and there is every indication that construction of airports will assume greater

importance in this respect, especially since these are always near centers of population and are therefore potentially more serious offenders. Moreover, the ability of planes to transport infected mosquitoes long distances may intensify this hazard.

The *anopheles* mosquito spreads malaria; no other mosquito does. The *aedes* and possibly other species spread dengue; the same species may transmit some of the sleeping sicknesses. In all cases, the mosquito acts only as a vector of the disease, and then only after it has bitten someone who is in the infective stage of the disease. Malaria is the most important mosquito-borne disease in the United States. In general, malaria is more severe and a much greater hazard south of the Ohio River and of a line running west from its mouth; but it has occurred in New England, Michigan and the middle west. Anopheles mosquitoes are found in areas as far north as Minnesota and could transmit malaria from one person to another there. Malaria is going north along the Mississippi, probably as a result of the navigation dams on that river, and is now found well up into Wisconsin.

Mosquitoes must have standing on very slowly moving water in which to breed (this applies to the U. S., and is not true all over the world), and this water must persist for 8 or 10 days, which is the time required for mosquito eggs to develop into full-grown mosquitoes. Therefore, to prevent mosquito breeding,

structures must be so designed as to remove all standing water in less than a week. Ditches need not be excessively large but their action should be certain.

Culverts that are improperly installed are probably the most common mosquito producing factor along the average highway. If the culvert is too high, a constant pool of water is maintained at the up-stream end. If the culvert is too low, water is held continuously in the culvert. An improperly constructed outlet results in a pool at the lower or outlet end of the culvert. All of these are ordinary defects, found along almost every stretch of road. All of them are representative of poor practice in highway maintenance and construction.

Fills that have blocked off natural drainage areas, even though these are small, or are little more than seepage areas, are another common cause of undue mosquito production along highways. Drainage should be provided for all of these places and it is good highway practice to do so.

Roadside ditches, especially grassy ditches, that hold water are preferred breeding places for malaria mosquitoes. It is good highway practice to grade ditches to a positive outlet, and this will prevent important mosquito breeding, too; but care should be taken to carry the discharge to a natural drainage channel. Discharging the water to a farmer's meadow may create even more favorable mosquito breeding places.

Borrow pits, whether for fill, sand, gravel, silt or clay, may hold water and permit heavy breeding. Sand and gravel pits are least likely to offend, but it is good practice to drain all borrow pits, if it is possible to do so; and it is generally good practice to think a couple of times about where they can be drained to, before starting to take dirt from them. This means that on a contract requiring borrow, the engineer should locate the pits, and not leave this responsibility to the contractor.

Construction activities may involve all of the points already mentioned, as well as ruts and such special structures as pits for stone unloaders, sometimes foundations, and numerous other items that occur only occasionally on any one job.

Blocked or inadequate storm drainage, resulting in overflow of adjacent fields, may produce prolific mosquito breeding. This may happen with the best of designs, but it is more likely to happen where the know-how was lacking. Replacement of inadequate storm drainage facilities is usually a costly and difficult job, but newer methods of driving pipes through embankments may offer a reasonably cheap form of relief. Like



Courtesy Army Air Forces

Careless construction leaves many mosquito breeding places, such as those shown above.

most of the other items enumerated, correction of such defects is merely good highway engineering.

The same general defects may occur around airports and the methods of correction are generally the same. In fact, the extra cost of obtaining adequate mosquito control through the application of good highway engineering practice is almost nil. Some experience and training in mosquito control and some knowledge of mosquitoes is necessary to do a good job.

All state highway departments, with very few exceptions, should have malaria control engineers in their employ. Except for the largest states, one man should be sufficient. Because he is basically a civil engineer, such a man, understanding the problems of construction and maintenance, could work with and as a part of the designing and construction organizations. In some cases he could do a portion of drainage design in addition to his other duties. Many excellent young engineers who have had sound experience in mosquito control with the Army in this country and overseas are now available.

Much helpful advice on prevention of mosquito breeding can be obtained, in the absence of a specially qualified malaria control engineer, from State Boards of Health, and they should be consulted. This is especially the case in those states in the "malaria belt," but it is precisely those states that also need most the full-time services of a malaria control engineer. Stupendous sums will be spent for new highways during the next few years. It would be a serious commentary on the efficiency of engineers if these new highways contributed even a small amount to the ill-health of the communities they are intended to serve.

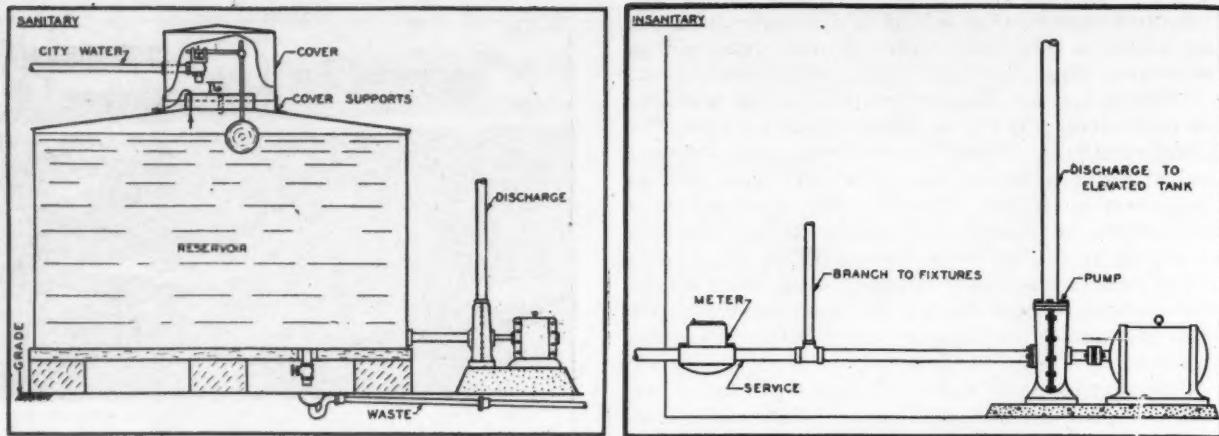
The ditch along the road at the left has been graded properly and the small amount of water retained can be oiled easily. The ditch along the road at the right will breed mosquitoes prolifically and control will be difficult.

Courtesy Signal Corps, U.S.A.



Courtesy Malaria Control in War Areas





The proper way at the left and the unsafe way at the right to connect water lines. In the unsafe way, a partial vacuum may be created.

Practices of City Water Departments in Regard to Cross Connections

The officials of approximately 1000 water works, in returning a questionnaire on water works policies and needs, answered a number of questions indicating their practices on matters of general interest. One of these questions referred to cross-connections, and about two-thirds of those returning the questionnaire replied to this question. The questions were:

"Do you regularly inspect factories, industrial plants, etc., for cross connections?"

"When cross-connections exist do you require disconnection?"

"Do you require double check valves?"

"What devices do you use on 4-inch and smaller lines having connections to unsafe or potentially dangerous sources?"

Answers are summarized by states below.

Alabama—Four replies: Two cities inspect factories, industrial plants, etc., regularly for cross-connections; all require disconnection; one permits a special back flow preventer; one a broken or gap connection.

Arizona—Six replies: two inspect regularly for cross-connections; six require special protective equipment; one permits broken connection and one has used the Clayton device.

Arkansas—Six replies: Four inspect regularly; Magnolia "refuses to service any plant without checking to make sure their water cannot enter our system"; one city permits a single check valve; two cities require double check valves; two others require a "break."

California—Thirty-eight replies: sixteen inspect regularly and two occasionally; fifteen require double check valves, and one a single check valve;

Colorado—Twelve replies: Five inspect regularly and five occasionally; all require disconnection; Denver does not permit check valves or other special devices, but requires "no cross-connections." Alamosa "tries to do away with any possible dangerous connection." Boulder "does not use devices and avoids possible cross connections." Loveland answered, "Maintenance men take care of this."

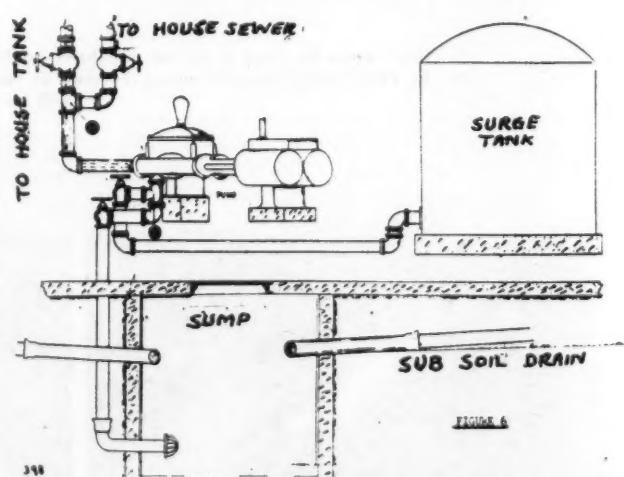
Connecticut—Nine replies: three inspect regularly and one occasionally. Bristol "discontinues the supply until the hazard is removed." Groton states that "swing connections are preferred."

Florida—Eight replies: five inspect regularly; five require disconnection; Fort Lauderdale requires broken connections; and does not permit double check valves or any other special devices. St. Petersburg reports that "no physical connection is allowed." Tampa states that "broken connections are required; if a customer wants two water sources, he must have dual water lines."

Georgia—Ten replies: three inspect regularly; two require disconnection.

Idaho—Five replies: three inspect regularly; three require disconnection.

Illinois—Thirty-seven replies: fifteen inspect regularly; eighteen require disconnection; seven require single check valves. Aurora reports, "We cut them off." Bloomington replies, "Vacuum breakers in case of pressure loss." The city of Carlinville states that

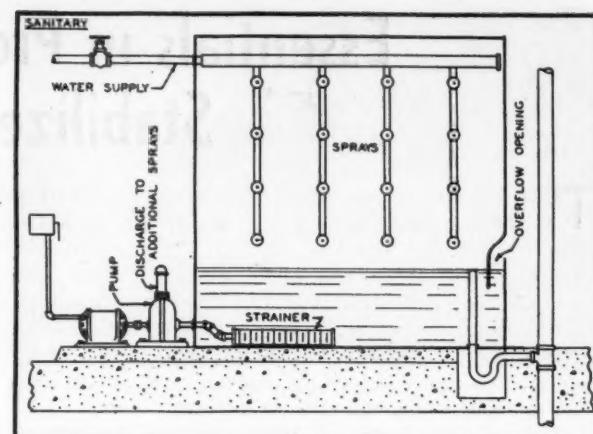


Potential cross-connection from multiple use of single pump unit.

"We will not furnish service where any attempt is made to connect private water sources with any line connecting with our supply." Carthage reports, "We don't have any." Evanston uses "Vacuum breakers, double checks or disconnection." In Glen Ellyn, "No connections are permitted." Jackson reports "No such connections allowed." Johnson City reports "There are no cross connections." Lockport states they "Use a removable nipple; it is in use only when water is supplied from city mains." Mattoon reports, "Will not tolerate connections." In Mt. Olive, "We disconnect as far as possible for safety of our water." Naperville states, "We have none; any number of check valves does not guarantee a safe cross connection." Princeton requires "Physical disconnection." River Forest reports, "We have no such connection." Robinson states, "We make them disconnect." The city of Rochelle reports "We have none smaller than 4. Where cross connected we require the customer to use the same precautions as we do in keeping their water supply safe from contamination. We test and inspect their water supply regularly." West Chicago states, "We allow no cross connections."

Indiana—Twenty-two replies: fourteen inspect regularly; nine routinely require disconnection and two occasionally; eleven require double check valves, and three single check valves. East Chicago states that they do not have any cross connection. Goshen reports, "No dangerous sources." In Indianapolis, "We comply with the requirements of the Indiana State Board of Health." Jasper states that "We do not allow cross-connections." Double check valves are used on 4-in. and smaller in Lafayette; and double check and double gate valves in Lebanon. "Have none" is reported by Michigan City. Nappanee reports they use "2 checks, 2 gates, crosses with gauge connections and pet cocks." "Standards set up by Indiana State Board of Health followed in toto" by New Albany and Jeffersonville.

Iowa—Twenty-seven replies: nine inspect regularly; sixteen require disconnection; two require double check valves, and three single check valves. Cedar Rapids reports using "A swing connection which can connect with only one supply at a time." Charles City says that they "Do not allow cross connections." Clarinda states they "Have none of those connections." Estherville reports that "We require complete separation." Fort Dodge states "No direct connection allowed." Harlan reports that "We have no cross connections whatever." In Indianola they "Don't allow any cross connections." Keokuk says that "We use removable spool connection or fire hose connection to supplier." Maquoketa reports "Complete disconnec-



Safe air conditioner connection.

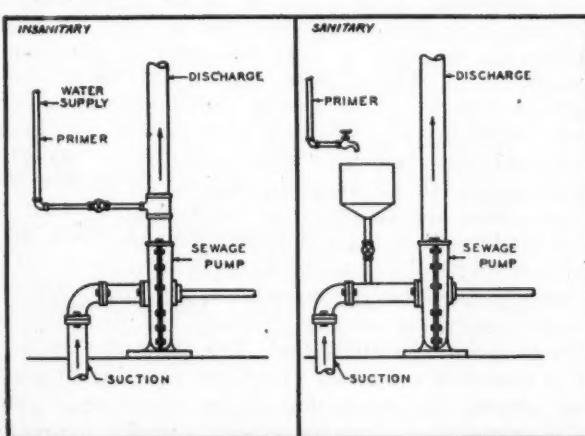
tion." Marshalltown reports that "We just do not permit cross connections." Ottumwa says, "Have none; they are not permitted."

Kansas—Eighteen replies: five inspect regularly; ten require disconnection; two require double check valves, and one a single check valve. Cherokee states that they "Do not have any cross-connections." Marion reports "We do not have any connections to such sources." Ottawa says they "Try to have them eliminated." In Topeka, "Cross connections are governed by the State Board of Health." Yates Center "Demands disconnection."

Maine—Six replies: five inspect regularly; three require disconnection; three require double check valves. Auburn reports, "We plan to have no such direct connections." Augusta "requires discontinuance." Sanford states they "Disconnect."

Massachusetts—Thirty-six inspect regularly and one occasionally; twenty require disconnection; twenty routinely require double check valves, and one occasionally; 1 permits single check valves. Andover reported, "Double check—Massachusetts standard." In Athol, "Double check valves." Attleboro states, "Massachusetts Department of Health requirements." Belmont reports, "We have only one large cross connection (hospital) which is inspected every 3 months; there are two other cross connections (dairies) but on small lines." Boston states, "We do not allow cross connections." In Cambridge, "No connection with unsafe supplies." "Physical disconnection" is reported by Concord. "Double checks" is reported by Easthampton. Greenbush reports "Check valves." Maynard reports "Double check valves." Melrose states "Double check valves; inspect quarterly." Milton reports "Physical separation of supplies." In Newburyport they "Double check to 2-inch according to State Law." North Andover reports "Double checks." "Double check valves or swing connections" are reported by Palmer; and "Either double check valves or swing connections" by Reading. Salisbury states "Disconnection on service lines; double check on pump primers." "None smaller than 6-inch" is in use by South Hadley Falls. Taunton states they use "Check valves or swing connections." Wakefield reports "Double check valves as prescribed by the Mass. State Dept. of Public Health." Ware reports "Not allowed." Webster states "Required to disconnect." "Check valves regardless of size" is reported by Westfield. Wrentham states "Double check and valves and gauges (Mass. standard)."

Information regarding practices in other cities will appear in forthcoming issues of PUBLIC WORKS.



Priming device for lift pumps to prevent contamination.

Essentials in Producing Plant-Mix Stabilized Material

THE economy of production of stabilized material by the plant-mix method is aided greatly by knowledge of material location, the characteristics of these materials and a predetermined design of mix made to fit the materials available. The procedures employed in Michigan to further quantity production were described by C. M. Ziegler, State Highway Commissioner, in a paper before the American Road Builders' Ass'n, from which the data below are taken.

The soils engineers of Michigan have located and made a material inventory of adequate sources of binder soil and aggregates in all the counties where the soil classification indicates that materials may be suitable for stabilization. These various material locations have been assigned pit numbers, provided actual material has been used or test data are available on the soil properties. The pit numbers and test results have been tabulated in book form and are made available to all contractors bidding in Michigan. Adequate information on material sources tends to lower contract prices for stabilization since contractors not familiar with certain areas can select the source of materials without costly exploratory investigation.

Grading analysis and plasticity tests are usually required for the design of stabilized mixtures. If the aggregate and the binder soil have been taken from soil types correlated with physical soil tests, the essential control can be reduced to grading tests. The production of uniform coarse aggregate and the restriction of soil fines (passing 200-mesh sieve) permits the design of stabilized materials on the basis of grading tests. Very few cases occur in production of coarse aggregate where the material passing a 200-mesh exceeds five per cent. The soil fines are mostly silt, since the top soils covering the aggregate deposits are usually removed prior to production.

Usually binder soils with plasticity indices greater than 25 are difficult to disintegrate and mix uniformly with the coarse aggregate when their natural moisture is above the plastic limit. High P. I. clays should be avoided when stabilizing during the wet season of the year. If they must be used, they should not be removed from the deposit prior to the period of processing the coarse aggregate, since they are apt to absorb less moisture in the undisturbed state than they will in a stockpile. If the moisture content of the clay deposit in its natural state is above the plastic limit, some benefit may be derived from stockpiling the clay and protecting it from excessive rain or snow so it can air dry prior to its use for stabilization.

The lower P.I. clays usually are less affected by adverse weather conditions. In general the lowest P.I. binder soils, which can be used properly, will aid in obtaining high production of stabilized materials. Time and effort spent by the engineer or contractor to locate and use low P.I. clays will pay dividends. It often has been more economical to produce a coarse aggregate low in fines and make use of a sandy binder soil than to produce a sandy aggregate and stabilize with high P.I. binder soils.

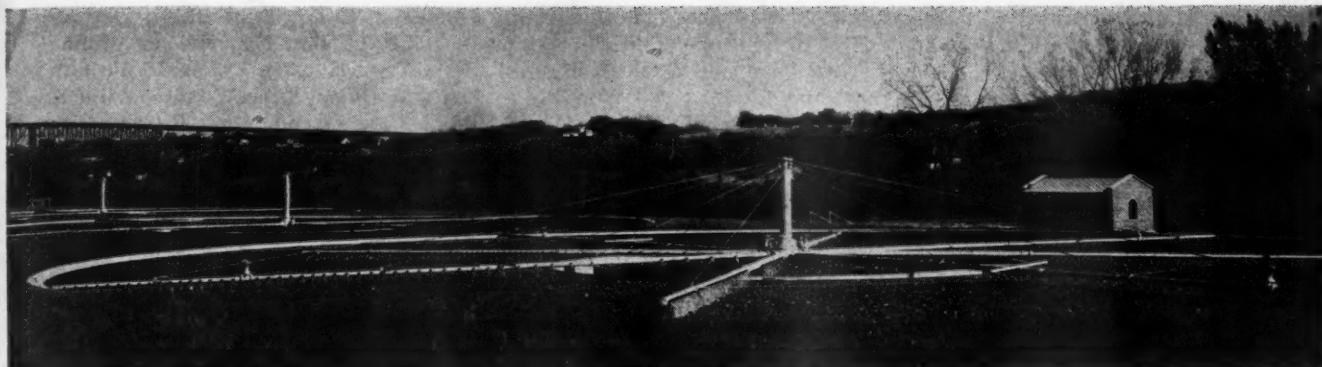
It is usually necessary to add chemical admixtures to aid in the rapid compaction of the material after placement on the road. Usually 5 to 15 pounds of calcium chloride or 10 to 20 pounds of sodium chloride

per ton of mix are added to aid in compaction. Dependent upon the climatic conditions, the quantity may be varied by the Engineer. Water is added to the stabilized mixtures during the mixing operation. The mixes are usually designed slightly above the optimum moisture content to compensate for the loss of moisture by evaporation during compaction.

A study of test results indicates that a high degree of uniformity of grading can be expected when materials are stockpiled prior to the stabilization period. For this reason the Michigan State Highway Department requires that all materials used in stabilization must be stockpiled. The use of stockpiled materials enables the contractors to obtain maximum efficiency from their stabilization units although causing a re-handling. Under previous specifications, these plants could be limited by the production of the portable gravel plants. The process of stabilizing of aggregates averages 25 tons per hour and in extreme cases as much as 60 tons per hour more than the production of the average portable gravel plant. This increase in output more than compensates for the extra cost of stockpiling materials prior to stabilization. Cost of stabilizing adds approximately 35 cents a ton to the normal production cost of gravel. This additional cost, however, is more than offset by reduced maintenance costs and improvements in surface quality.

Experience indicates that satisfactory plant-mix stabilization is dependent upon rigid field and laboratory inspection during the production of the materials. The Michigan State Highway Department has developed the following inspection routine to insure quality production of plant-mix stabilized materials. Prior to starting the aggregate production the sources of aggregate and binder soils are tested unless they occur in soil types which are known to be satisfactory for stabilization work. The samples are sent to the laboratory by a district soil engineer, or in some cases, by the travelling materials inspector. After the materials have been tested and approved by the Laboratory, an inspector is assigned to the project.

The inspector uses gradation tests to control the production of material. On the basis of these tests extreme variations in grading are corrected by regulating the amount of sand ejected during the crushing and screening of the material, or by regulating the amount of oversized material that is being crushed. Often the remixing of bank run material will correct variations in grading. Sometimes several faces of the gravel deposit can be worked simultaneously to correct variations in grading. In some cases the produced material may lack a sufficient quantity of material passing the No. 40 sieve and retained on the No. 200 sieve. This material must be mechanically added to the binder soil at the stabilizing plant in case a suitable binder soil cannot be found to correct the deficiency at the time the material is stabilized. All the coarse aggregate must be produced and stockpiled in layers, prior to stabilization. This procedure reduces to a minimum any minor variations occurring in grading during the production of the coarse aggregate. The gravel plant inspector submits a weekly composite grading sample to the Laboratory.



Surplus property should be available for needed water and sewage treatment improvements.

How to Order Surplus Water and Sanitation Property at a Discount

Instructions to eligible public health claimants for purchasing surplus property at a 40% discount from "fair value" have been issued by the U. S. Public Health Service, which serves in an advisory capacity in the War Assets Corporation in the distribution of surplus property to the public health field.

Eligible public health claimants include state, county and local public health agencies such as health and sanitation departments, water works which are publicly owned and which supply water to a community, publicly owned sewerage and sewage treatment systems, and garbage and refuse disposal departments that are publicly owned.

The Public Health Service maintains a list intended to include the names of all claimants eligible for a discount under Regulation 14. Since this list is a basis for approval, applicants in doubt as to their status should check with the nearest representative of the Public Health Service, Office of Surplus Property Utilization, to be sure they are represented. Locations of these representatives are listed at the end of this article.

Information about available surplus property can be obtained from regional offices of the War Assets Corporation, a list of which appears at the end of this article. These offices will furnish upon request a list of property available for sale. There are two arbitrary classifications—"consumer goods" and "capital goods."

The Editor of PUBLIC WORKS, on the basis of information furnished so far, is unable to tell what kinds of items are included in each category. It is recommended that requests be sent to the appropriate one of the 11 WAC regional offices, at each of which a representative of the U. S. Public Health Service is stationed. The addresses and telephone numbers of these offices are listed at the end of this article. The requests should ask for a list of sales offerings of consumer goods.

A similar request for a list of standardized items of capital goods should be sent to the nearest of the 31 regional WAC offices named in the second list at the end of this article.

In the consumer goods lists, the states covered by each office are shown. In the capital goods lists, this is not given, and it will be necessary to write the nearest

of the offices. In writing in regard to consumer goods, address the Public Health Specialist in charge, U. S. Public Health Service, Office of Surplus Property Utilization, at the appropriate office. In writing for capital goods lists, simply address the War Assets Corporation at the appropriate office.

To buy "consumer goods" listed as available by the disposal agency, the claimant uses his usual purchase order form. The order (in quadruplicate) should be drawn to the office of the disposal agency listing the property, should request only items that appear in such listing, and should be prepared according to conditions accompanying the offering by the disposal agency. On the body of the order the buyer should state that "Funds are available for the purchase of these items at fair value less 40%." The disposal agency will normally accept only a formal purchase order. In case of emergency, however, the disposal agency will accept a "letter of intent," indicating that the applicant is willing to purchase the specific items requested, to be followed at the earliest practicable date by the claimant's formal purchase order.

For the purchase of capital goods, the claimant's usual purchase order form (in quadruplicate) may be used as outlined above. However, the disposal agency will accept a "letter of intent" in lieu of the purchase order form. It is not essential that capital goods requested be contained in a published list of available property.

An application should be prepared (in duplicate) to accompany the claimant's order. It should be addressed to the Office of Surplus Property Utilization, United States Public Health Service, and should comprise the following parts:

1. A request that a 40% discount be approved for the accompanying purchase order.

2. A statement as follows:

"The applicant represents and warrants that: It is an instrumentality or nonprofit institution as defined in SPA Regulation 14; that the property ordered in the attached purchase document is required for its own use and to fill its own existing need for carrying on medical, public health, or sanitation activity; that the property will not be resold within three (3) years of the date of the purchase without the consent in writing of the disposal agency."

3. A statement which will show the ways in which and the extent to which the public health will be benefited by the applicant's use of the property being ordered. This statement should show how and to what extent the volume or quality of service will be increased and why the area served by the claimant needs such an increase.

4. Signature and title of a responsible official.

Send or take all four copies of the order (regular purchase order form or "letter of intent") and both copies of the application to the appropriate representative of the Office of Surplus Property Utilization, Public Health Service for approval. If, on the basis of eligibility and need, the discount is authorized, the Public Health Service representative will send the order directly to the disposal agency to be filled. In many instances, it may be advisable for the buyer to make an inspection or selection of property and present the approved order in person at the time of the sale. In that event the approved order will be returned to the claimant at his request.

Regional Offices for Surplus Property Disposal

The regional offices of the Office of Surplus Property, Consumer Goods Division, Dept. of Commerce, are listed below, with addresses, telephone numbers and states served:

1. New England—600 Washington St., Boston 11, Mass. Phone, Lafayette 7500.
2. New York and New Jersey—Empire State Bldg., New York 1, N. Y. Phone, Murray Hill 3-6800.
3. District of Columbia, Delaware, Pennsylvania, Maryland and Virginia—Lafayette Bldg., 5th and Chestnut Sts., Philadelphia, Pa. Phone, Walnut 4400.
4. Indiana, Kentucky, Ohio, and West Virginia—704 Race St., Cincinnati 2, Ohio. Phone, Parkway 7160.
5. Illinois, Michigan, North Dakota, South Dakota, Minnesota and Wisconsin—209 South La Salle St., Chicago 4, Ill. Phone, Franklin 9430.
6. Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina and Tennessee—105 Pryor St., N. E., Atlanta 3, Ga. Phone, Walnut 1301.
7. Louisiana, Texas, Arkansas and Oklahoma—Post Office Box 1407, Fort Worth 1, Tex. Phone, 2-1287.
8. Iowa, Kansas, Missouri and Nebraska—2605 Walnut St., Kansas City 8, Mo. Phone, Harrison 0375.
9. New Mexico, Utah, Colorado and Wyoming—728 Fifteenth St., Denver 2, Colo. Phone, Keystone 4151.
10. California, Arizona and Nevada—30 Van Ness Ave., San Francisco 2, Calif. Phone, Underhill 1922.
11. Oregon, Montana, Idaho and Washington—2005 Fifth Ave., Seattle 1, Wash. Phone, Maine 2782.

Other Consumer Goods sales offices are or will be located in the following cities: Birmingham, Charlotte, Cleveland, Dallas, Detroit, Helena, Houston, Jacksonville, Little Rock, Los Angeles, Louisville, Minneapolis, Nashville, New Orleans, Oklahoma City, Omaha, Portland, Richmond, St. Louis, Salt Lake City, San Antonio, Spokane.

Addresses of War Assets Corporation Offices for Capital Goods

Ford Bldg., Atlanta, Ga.; Jemison Bldg., 2105 3rd Ave. N., Birmingham 3, Ala.; Sheraton Bldg., 10 Post Office Square, Boston 9, Mass.; 317 Tryon St., Charlotte 2, North Carolina; 208 S. La Salle St., Chicago 4, Ill.; Newman-Stern Bldg., Cleveland, Ohio; 301 Cotton Exchange Bldg., Dallas 1, Texas;

Boston Bldg., Denver 2, Colo.; Buhl Bldg., Detroit, Mich.; Power Block, P. O. Box 177, Helena, Mont.; Rusk Bldg., 723 Main St., Houston 2, Texas; Western Union Bldg., Laura & Duval Streets, Jacksonville 2, Fla.; Dierks Bldg., 1006 Grand Ave., Kansas City 6, Mo.; Wallace Bldg., Markham & Maine Streets, Little Rock, Ark.; Pacific Mutual Bldg., 523 W. 6th St., Los Angeles 14, Calif.; Lincoln Bank Bldg., 421 W. Market St., Louisville 2, Ky.; McKnight Bldg., 2nd Ave. So. & 5th Sts., Minneapolis 1, Minn.; 7020 Franklin Ave., New Orleans, La.; Consolidated-Vultee Plant, Nashville 3, Tenn.; 70 Pine St., New York 5, N. Y.; Cotton Exchange Bldg., Oklahoma City 2, Okla.; Woodmen of the World Bldg., Omaha 2, Nebr.; 1528 Walnut St., Philadelphia 2, Pa.; 310 S. W. 6th St., Portland, Oregon; Richmond Trust Bldg., 7th and Main Sts., Richmond 19, Va.; 505 N. 7th St., St. Louis, Mo.; 101 W. 2nd St., Salt Lake City, Utah; Transit Tower Bldg., S. Saint Mary St. at Billita St., San Antonio 5, Tex.; Barneson Bldg., 256 Montgomery St., San Francisco, Calif.; Central Bldg., Seattle 4, Wash.; Welch Bldg., 610 W. Maine Ave., Spokane, Wash.

Outstanding Water Bills

R. C. Cope, Supervisor of the Water Division, St. Louis, Mo., has written further in reference to our items in the November and February issues on this subject. Mr. Cope says:

Mr. W. A. Hardenbergh, Editor,
PUBLIC WORKS,
310 E. 45th Street,
New York 17, New York.

Dear Sir:

I received your answer to my letter several days ago and will give you a few of the reasons why our delinquent accounts are almost negligible.

The Water Department of the City of St. Louis has a very fine Water Rates Ordinance. All bills become due once every six months and unpaid bills do not become a lien against the property.

Our city is divided into twelve districts and each district is divided into six due dates. The bills for each one of these due periods in each one of the twelve districts are mailed every other day for four weeks during the month. These bills become delinquent fifteen days after the due date. At this time a delinquent notice is mailed to the water consumer. If a bill remains unpaid for a period of seven days after the delinquent notice is mailed, a last, or final, notice is delivered to the premises in person by the field inspector. If the bill is not paid within three days after this last notice is delivered, the water may be shut off unless there is some circumstance making it advisable to give further service.

During the past five years the water consumers in St. Louis have been taught to pay bills promptly. They know that if the bill is not paid water service will be discontinued. During the past several years economic conditions have had a great deal to do with making collections easier. At the same time it is necessary that we watch our delinquent accounts very closely and see that these bills do not stay delinquent for any length of time.

We have a field inspector in each one of our twelve districts whose duty it is to see that bills are paid. Water bills in St. Louis are paid six months in advance, and 90% of our 135,000 accounts are paid on a flat rate basis.

General plan of Idlewild Airport showing runway arrangement described in text.



Airport Planning and Design Factors

By W. E. CULLINAN, Jr.

Essential elements to be considered in planning and designing airports, slightly condensed from a paper before the ARBA. Surveying need; canvassing local industry; determining number of runways; locating the field; providing ground movement efficiency; and planning buildings.

THE most important problem in airport design is the determination of the ultimate size and type of facilities required to serve the needs of the area. This will depend on the type of aviation activity contemplated, giving consideration to long-range planning for future operation. The ultimate size should naturally be broken down into increments which can be constructed in stages to satisfy current aviation requirements. In arriving at this estimate, the following factors should be given consideration:

1. The travel habits of the residents of the community and its trading area and the value of the airplane to them for business and pleasure.
2. Present and future airline and feeder line requirements intrastate and interstate.
3. The present or potential tourist travel by air including private planes and charter flights.
4. The postal receipts of the community and its trading area as an indication of air mail and air express possibilities.
5. The adequacy and volume of surface transportation between the community and other communities of common business and social interests.
6. The value of an airport in the area as an emergency landing field or for refueling or for convenience.
7. The existence of schools, colleges, or technical institutions in the vicinity where aeronautical education, training, or research may be conducted.

8. The existence of industries manufacturing products allied to aviation or products such as perishables for which air transportation offers certain advantages.
9. The value of existing or proposed airports in the vicinity in serving the local needs.

A canvass of local business and industrial firms in the community will help in determining the potential usage of air transportation for personnel and products and for company operation of their own planes. In several small communities, such a survey disclosed that one or more local firms were planning to own and operate company planes requiring facilities of a larger class than needed for private flying exclusively.

The analysis of these local characteristics will determine the general size classification of the airport facilities ultimately required. In most cases it will be found that small airports of Class 1 or Class 2 type are the maximum size that can be justified. These fields will handle small-plane private flying and training, executive type company-owned planes, and the type of equipment specified by the Feeder Airlines Association for shorthaul commercial operation. Most fields will have turf landing strips until the volume of operations, and maintenance conditions during wet seasons, requires a low-cost pavement on one or more of the strips.

Having established the airport size, the next problem is: How many runways or strips are necessary, and in what directions? The relationship between the number and alignment of runways and the over-all wind conditions will largely determine the percentage of time that the airport will be available for safe use. This is the "percentage of wind coverage." This phase of design often offers the greatest possibility for economy since thorough analysis of local wind conditions may make possible the design of a runway pattern which will provide a high percentage of wind coverage with a minimum number of runways. At one airport in New England, designed for the Army under the CAA program, an investigation of wind conditions made possible the elimination of a proposed third runway with a resultant saving of \$500,000. The two runways which were constructed at this site provided 96 percent wind coverage. I can also recall several older fields with three and four runways, apparently laid out to provide minimum property acquisition, to achieve construction economy, or because of lack of detailed wind information, where a modification in layout with one less runway at each field could have provided a higher degree of wind coverage than is now obtained.

Therefore, communities which are now considering airport development should start immediately recording of wind data in order that their designs may provide the maximum of utility and economy.

With the knowledge obtained from the foregoing studies, the landing strip requirements (number, length, and direction) for the local airport become established, and the examination and evaluation of sites become practicable. However, site selection involves a much broader concept of an airport than the engineering and construction problems connected with the grading, drainage, and paving of the runways. Aeronautically, an airport is a saucer-shaped surface approximately 5 miles in diameter with the small flat area in the center representing the landing field and the wide, inclined rim corresponding roughly to the aerial approach and turning areas. It is this rim or approach area extending several miles from the field boundaries that is usually the controlling factor in site selection and runway layout.

The approach zone problem in airport design is twofold. First, the selection of a site and design of a runway pattern which is free, or can be made free, from obstructions which would reduce the utility of the landing facilities or create operational hazards. Second, the maintenance of unobstructed approaches through approach protection in the form of aviation easements or airport zoning to prevent the erection of structures of a height which would impair the utility or safety of the field. The importance of this phase of airport design can be demonstrated most effectively by citing costly experiences which unfortunately are not isolated cases.

One important industrial section of New York with an aggregate population of 150,000 is served by a well constructed airport and paved runways approximately 3500 feet in length which were built at a heavy cost, and with considerable additional investment in buildings and other facilities. During the past year, three major airlines have been certificated to serve this municipality. However, in spite of the adequacy of the facilities within the boundaries of the airport, not one of these air carriers can use this airport due to the existence of hills located from one to three miles from the field which constitute approach

obstructions and which create downdrafts reducing the effective rate of climb. One airline which surveyed this field computed the effective length of one of the runways to be 700 feet, whereas its physical length was 3500 ft. Nothing, regardless of expense, could be done at this site to remedy the situation. Plans are now nearing completion for a new airport which will cost approximately \$3,000,000 for grading, drainage, and paving. This new site provides approach conditions whereby unrestricted night and instrument operations will be possible. The school of experience was effective in this case but the tuition was very expensive.

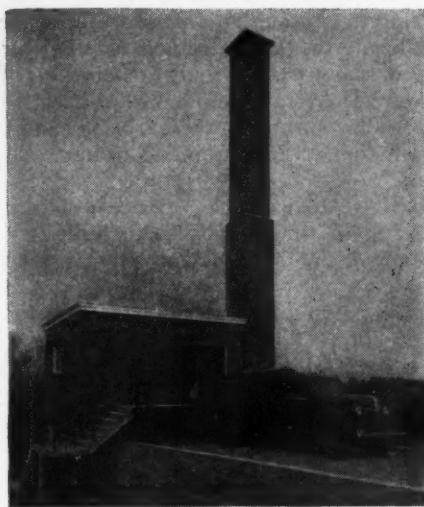
There are several places where large structures erected adjacent to existing airports have reduced utility or the safety of operations. The outstanding case is a Class 4 airport which has 3 paved E-W runways, only one of which is now fully usable, due to the construction of a manufacturing plant and its subsequent expansion. The bill for this experience approximates \$750,000.

Where predominant use of one particular runway can be anticipated from the wind characteristics, the buildings should be centrally located with respect to that runway. Such an arrangement will reduce the taxiing distances between the hangar or service area and the runway on which the volume of operations is the greatest. This principle should, of course, be incorporated into the general design and layout of the entire field. An efficient taxiway system will allow a quick clearance of landing aircraft from the runways and provide continuous access to the take-off points with a minimum of delay. The provision of taxiways can more than double the number of flight operations which a field can handle, and eliminates excessive waiting periods for take-off or landing clearance.

The importance of efficiency in ground movement for large terminals is perhaps most forcefully demonstrated by the tangential runway pattern adopted for the New York City field at Idlewild shown herewith. In this, the take-off points are near the center of the field close to the terminal area, and the terminal landing area is near the end of the runways.

The design of a master layout for any field should include plans for a taxiway system. Otherwise, a runway or landing strip layout may be selected which, although most economical for its construction, may require a long and extensive taxiway system to service the runways. The taxiways may be nearly as expensive to build as the landing facilities and may contribute excessively to maintenance and snow removal costs. We have had two airport layout problems referred to us recently where our analysis of the taxiway system caused us to revise our proposed runway layout several times. In doing so, we were able to reduce the taxiway system from nearly 10,000 ft. in length to less than 3,000 ft., and the cost estimate for the completed field was reduced.

Planning for an adequate area for airport buildings should also receive special attention. Use of this area is the chief source of revenue from the airport. The lack of space for additional aeronautical buildings tends to prevent or retard hangar construction and lose a potential source of additional revenue. Therefore, it is important that the airport design provide sufficient space for buildings and include the grading of this area in estimating the airport cost. Unless a master plan for service and unit hangars, administration building, entrance roads, etc., is designed at the outset to guide the orderly development of this area, a hodgepodge of construction may result and operation may become inefficient and unprofitable.



Incineration or burning is used for disposal.

Methods Used by Cities for Disposal of Sewage Sludge

A summary of information on sludge disposal methods as reported by city engineers.

PRACTICES in regard to the disposal of dried sewage sludge were reported to PUBLIC WORKS by several hundred cities. The following data represent a summary of the information furnished by some of these cities:

In California, nine cities report the use or sale of sludge for fertilizer: Chico; Chula Vista (sold to a licensed fertilizer company); Corona; Orange; Redlands; San Francisco (the filter cake is used by the Park Commission); Santa Paula (sold to ranches at \$5.50 per ton); Stockton (used by the Park Dept.); and Turlock. It is discharged through outfall sewers by Culver City and Pasadena, and dumped into the ocean (presumably wet) by Laguna Beach. It is burned by Oroville; spread over a sandy area by Maryville; and disposed of on a sewer farm by Tulare.

Boulder, Colo., allows farmers to haul the sludge from the plant without charge. Farmers take it away at Sterling. Durango and Grand Junction use it as fertilizer; the latter "in isolated locations." Loveland "uses on city property, sells or gives away."

There seems to be no settled policy on disposal in Connecticut, from which only four cities reported. Bridgeport incinerates sludge; Bristol uses it for fill; in Darien it is used on "local gardens"; and in So. Norwalk-Norwalk it is given to anyone who wants it.

Chipley, Fla., wastes the sludge; Winter Park gives it away; Pensacola uses it for land-fill; in Panama City it is used as fertilizer for parks; and in Lakeland it is also used as a fertilizer, but the particular use is unspecified.

Sludge is ground by Tifton, Ga., and sold for lawn fertilizer. Thomasville, Ga., also uses sludge as fertilizer, while Moultrie hauls it "to remote grounds." Preston, Idaho, also uses the sludge as a fertilizer.

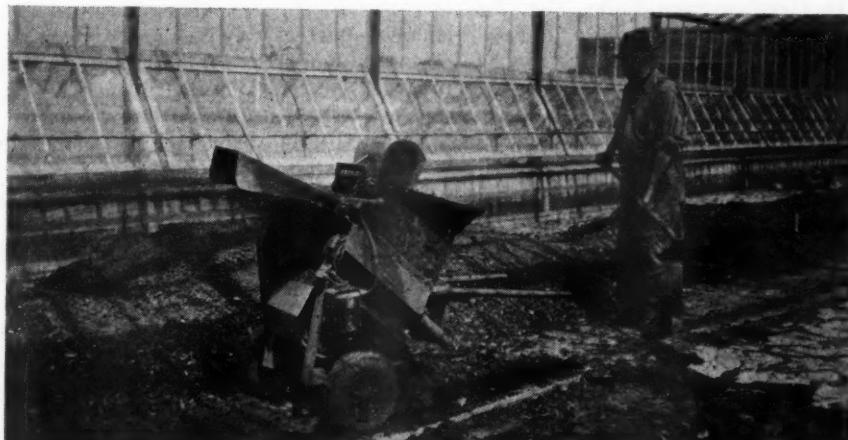
In Belleville, Ill., some is sold as a fertilizer; Canton donates it to anyone who will take it; Clinton hauls the sludge to the dumping grounds; sludge is spread out on farm lands in Depue; and in Hinsdale, Naperville, Nokomis and Steger, it is given to the farmers; Hillsboro

sells it, and Robinson spreads it on land belonging to the city.

Bloomington, Ind., sells some of the sludge commercially; in Crawfordsville, it is given to the Park Department and to farmers for fertilizer; Marion sells it to farmers; Tipton reports the farmers use it for fertilizer; East Chicago incinerates it; Hammond gives it to "whoever will haul it away"; Huntington and Loganport each dispose of the sludge on the city dump; "burial" is the practice in Muncie; Newcastle reports it is "free."

Charles City, Iowa, hauls the sludge to a nearby farm; it is disposed of on the city dump by Clear Lake; Davenport sells it; the farmers haul it away in Decorah; Indianola removes it by truck to farm fields; Des Moines uses it for filling low land and as fertilizer; Keokuk disposes of it in the river sewer outlet; New Hampton "carts it away"; it is given away to the "Park Dept., and to farmers for the hauling" in Newton; Orange City states, "piling it up—no other kind"; Waterloo uses it for filling lagoons near the disposal plant; and Webster City gives the sludge away for fertilizer.

Sludge is disposed of in the Missouri river in Atchison, Kans.; Augusta and Salina use it for fertilizer; it is used for filling holes along the river in Dodge City; El Dorado sells it for fertilizer; Ellsworth puts "it on a pile and the people haul it away"; Russell reports, "pile up"; in Emporia it is dumped



Many cities derive an income by selling sludge for fertilizer or use it on city grounds.

on the ground and hauled away later for fertilizer; and in Independence and Pittsburg it is hauled away by farmers for fertilizer; Liberal burns some of the sludge and some is used for fertilizer. Parsons has been "collecting it for years, but none has been disposed of"; the Park Department and individuals in Wichita use it for fertilizer.

The only city reporting a method of disposal in Kentucky is Danville, which disposes of the sludge on a dump and use it as fertilizer. Cambridge, Md., utilizes the sludge on the city farm.

In Attleboro, Mass., sludge is disposed of on an adjacent farm; Brockton reports that sludge is buried; it is dumped in lowland near the sewage disposal plant in Framingham.

Battle Creek, Mich., disposes of the sludge as "B. C. Plant food fertilizer;" incineration is used by Dearborn; various methods of disposing of sludge for fertilizer are reported by the following cities: Grayling (used for fertilizer), Holland (used as fertilizer by Park and Cemetery Departments), Hazel Park (to nearby farms and to gardeners), Jackson ("give it away, mostly to Prison farms"), Menominee (sold for fertilizer), South Haven (either sold or used by city for fertilizer), Zeeland (sold for fertilizer). Ironwood disposes of the sludge in the Montreal river; Lansing gives it away; Manistee reports "it is taken away faster than we can produce it"; Mason gives it away to those who want it; in Petoskey if there is no municipal need for it, "it is given free to private parties who haul it away from the beds"; Pontiac uses it for filling abandoned gravel pits and also sells it to farmers; Ypsilanti reports it is hauled away by private individuals, with no charge being made for it.

Sludge is disposed of into a lagoon for fill in Albert Lea, Minn.; the cities of Alexandria, Fairmont and Morris each give it to farmers, presumably for fertilizer; and it is used for fertilizer in Anoka, Eveleth and Hutchinson; Litchfield sells it for fertilizer; disposal in Duluth and Minneapolis is by incineration; the three cities of Granite Falls, Rochester and Winona place it on the city dump; in Hibbing it is given away, but some is sold; Montevideo hauls it to a field, and Springfield either hauls it to a field or uses it for fill. The present method in St. Paul is by burning, but the city is working on a fertilizer proposition.

The only city reporting a method of disposal in Mississippi is Pascagoula, which hauls the sludge to fields outside the city.

In Carthage and Rollo, Mo., the farmers take the sludge for fertilizer, while in Fredericktown, part is taken by the farmers and the rest hauled to the dump; Farmington sells it to farmers; Columbia uses it for fertilizer and Springfield sells it for the same purpose. Hannibal reports they have no drying beds; in Joplin the sludge is left in ponds; in Kirkwood it is contracted for; used for fill in Monroe City, and the citizens in Salem haul it away.

The city of Forsyth, Montana, gives the sludge away, and also uses it on city park lawns, while in Kalispell it is used on both city parks and golf courses. Sparks, Nevada, gives some of the sludge to farmers for fertilizer; the balance is burned.

Audubon and Phillipsburg, N. J., give the sludge to farmers, while in Camden it is placed on the city dump; in Jamesburg it is given to property owners; Metuchen uses some of the sludge for fill and some

for fertilizer; Princeton "ploughs it under" but some is used for fertilizer; the same method is used in Verona except that some of it is sold. Somerville reports that the "dewatered raw sludge is utilized by farmers"; South Amboy carts it to the garbage dump; and Tenafly sells it for fertilizer, some to dealers and some to consumers.

Three cities in New Mexico each report a different method for disposing of sludge: Carlsbad "sells it"; in Deming it is piled and burned, and Gallup puts it on the city dump.

Sludge is disposed of by Baldwinsville, N. Y., for fertilizer in parks and on flower beds; Ithaca's main use for it is in parks also, while Sidney uses it both for parks and nearby farms; in Batavia it is "wasted"; four cities—Bath, East Aurora, Fairport and Lackawanna—give it to farmers; Kingston reported "not available yet, but will be sold." Liverpool and Oswego give it away, the latter stating for fertilizer; in Lockport it is spread out on adjacent land for planting; Middletown stocks it; in Olean it is sold to gardeners and in Port Chester it is given to gardeners and also dumped; Scotia and Yonkers also place it on the local dump; the Oneida citizens haul it away for fertilizer; Ravana uses it for fill, and Williamsburg also uses it for fill at plant. Schenectady sells it for fertilizer purposes; in Springfield a system is being installed now; and a private contractor carts the sludge away in Suffern; Yorkville gives it away.

The cities of Albermarle and Burlington, N. C., utilize the sludge for fertilizer, the latter selling it; and Durham sells it also; Asheboro distributes it to cemeteries and uses it on filter plant lawns, while Lenoir spreads it on the city farm; Hickory gives it to the farmers of the community, but Kings Mountain sells it; High Point disposes of the sludge by two methods: beds and burial. In Jamestown, N. Dak., the sludge is disposed of on the dump, and in Valley City it is "given away for the taking."

Akron, Ohio, disposes of the sludge in lagoons; in Alliance, Hubbard and Lancaster it is given to the farmers; Bellefontaine utilizes it for fill; the cities of Bryan, Celina and Lima give the sludge away, the former two specifying for fertilizer; Massillon gives it away "for the hauling"; Dayton sells it for fertilizer; Mansfield "sells some and wastes the remainder"; Chardon reports they use it on land. Columbus and Cuyahoga Falls dispose of the sludge by incineration, and Piqua reports "incineration of wet sludge"; in both Urbana and Wadsworth, it is dumped in a field near the disposal plant; and it is hauled away by private individuals in Xenia.

The sludge in Ada, Okla., is hauled away for fertilizer; and several other cities report the use of it for fertilizer—Bartlesville, Cushing, Edmond (used by the farmers), and in McAlester it is used on parks, but a large portion is wasted. Blackwell stacks it at present; Guymon dumps it on nearby ground; it is disposed of in Pawhuska "through agreement with nearby property owners"; and in Tulsa it is utilized by the city parks, School Board and the farmers.

Three cities in Pennsylvania—Allentown, Grove City and State College—give the sludge to farmers, and Elizabethtown sells it to them; Nazareth reports "farmers use it for fertilizer"; in Ellwood City it is used for fill and some is given away; Greenville dumps it on low lands; the farmers, landscape men, etc., haul it away from the drying beds in Meadville, while New Castle also reports some of it is hauled

(Continued on page 34)

Two-Way Radio Saves Money on Snow Removal

Abstract of a paper by W. Bruce Chilson, Superintendent of Highways, Chautauqua County, N. Y., before the American Road Builders' Association.

A COUNTY Highway System sprawls over hundreds of square miles, and its equipment is by necessity scattered throughout the county, not staying "put" like factory lathes and drills, but changing from day to day—not infrequently, from hour to hour. In fact, in some operations as during snow-storms or other emergencies, the interval between times when communication with a working unit and the office is desired may be only a matter of a few minutes. In some cases these few minutes mean the difference between life and death.

Under conditions where a large percentage of the county road mileage is through rural areas where telephones, if any, are few and far between (as is the case in my county), the problem of co-ordinating activity is very difficult indeed. There is a way, however, which completely solves this all-important problem of communications. It is two-way radio-telephone. With this you literally bring your workers into your office. All units are in constant touch with headquarters, and to a certain extent with each other.

A truck driver does not have to leave an urgent job, wade through slush and snow to call the office. He simply keeps on driving, gets his orders through the radio in his cab. A foreman does not have to waste vital minutes leaving his job. Nor does he have to take the chance of having his message misunderstood by a third party sent to do the telephoning. He simply presses a switch and his voice travels to headquarters. A superintendent need never be in the dark on what his men are doing. By radio he is "sitting in" with his men and he hears and knows what is going on.

I will relate briefly some of the experiences we had with radio in Chautauqua County, New York. In 1941, my county had 36 units for snow removal on our 700-mile system. About 60% of these units were hired trucks used in construction and maintenance during the summer months, and on which, in the winter, we mounted snow plows. However, the Army's great demand for construction equipment, including trucks, left us at the beginning of the winter of 1942 and 1943 with 12 less snow removal units. This sounds like a catastrophe, and I was worried. With one-third less equipment, how were we to keep the highways safe?

But we did. And the winters were just as bad. The reason was that we had radio. We were able, through the medium of radio, to dispatch equipment as it was needed—instantly from one point to another. There was no lost motion. Each and every man and machine was performing *useful* work.

Aside from spectacular life-saving which occurred in my county and which has occurred with radio installation I have known, there is the day in and day out increase in efficiency, maybe not so dramatic as the rescue angle, but certainly very interesting to those who pay the bills. Such reduction in costs immediately reflects itself in the removal of waste

movement and "dead" mileage. There is, too, the increase in safety to personnel, and even here costs are reduced by virtue of fewer accidents and less sickness. Radio has a powerful effect on the worker's morale; he will not hesitate to go out in the worst weather when he knows that help is no further away than the microphone on his dashboard.

The public, of course, receives the greatest benefits from radio. Detours, for instance, can be handled more advantageously. Roads can be opened more quickly with the use of radio. Snow-blocked highways which could hold up vital emergency services—fire, police, ambulances, doctors—are rapidly opened, thus permitting help to come before it is too late.

And now a word about the technique of snow removal. The strategy has changed somewhat. Heavy plows and rotaries were often sent out automatically on highways which were known to have high drifts. The results were not too satisfactory—the slow-going equipment only operated about 30% of the time.

With radio, lighter and faster plows cover the road, skirt around drifts without a thought of bucking the deep snow. Instead, the driver notifies the dispatcher of the location of the drift. The dispatcher sends a rotary to the scene, and it isn't long before the drift is no more.

This process continues—the lighter snow plow taking away the surface snow—the rotary plow delivering the knockout blow to stubborn drifts. Several years of experience has proven the resultant economy of this "radio" control.

The Federal Communications Commission (FCC) has set aside a group of frequencies for the use of Highway Departments. There are 4 channels available in the 30 to 40 megacycle band and 6 channels in the 42 to 44 megacycle band. In addition, there are frequencies available in the 152 to 162 megacycle band, and a few, on a share basis, in the television band. That share basis is so that you don't destroy a television model's beautiful face with a truck dispatch!

Foam Phase Treatment of Sulphite Liquor

Two of the most difficult problems arising in the treatment of sulphite liquor by biological methods have been the foaming qualities of the liquor and the difficulty of maintaining aerobic conditions in treatment units. Recent experiments sponsored by the National Council for Stream Pollution and conducted by Dr. H. Heukelekian at the New Jersey Agricultural Experiment Station indicate that by making use of the foaming propensities of the liquor, aerobic conditions can be obtained. By employing a foaming technique together with a seeding process developed by Dr. Heukelekian for the treatment of penicillin wastes, rapid oxidation of the liquor has been obtained. The process is as yet in the exploratory stage.



Left, the digester and right, the sand ejector in the digester.

Cleaning a Digester

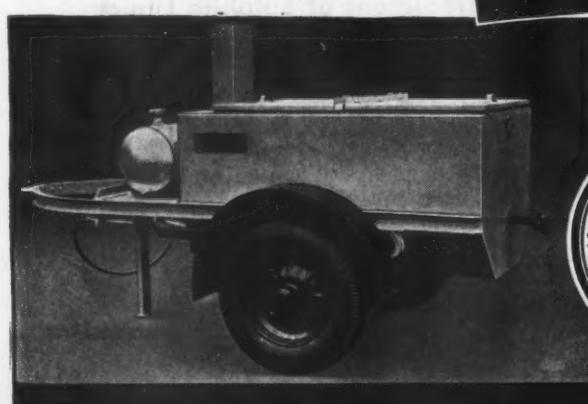
(Continued from page 19)

pit, where it is flushed into the digesters. All transfers from the primary tanks, whether sludge or grease, are by gravity into an observation well, where the material is picked up and pumped to the digesters. From the first-stage digester sludge can be drawn to the drying beds by gravity, but when the digestion tank must be emptied it is necessary to pump the material below a certain level from the digester into the incoming sewer, and run it through the plant.

The Ithaca sewage plant is located in the lowest part of the city on rather unstable ground. Over a period of years, the first-stage digester has settled unevenly, until at the present time the west side of the structure is about $4\frac{1}{2}$ inches lower than the east side. This interferes with the operation of the sludge scraper and stirring mechanism, which is supported from a top truss, and it is necessary to set the scraper blades

to clear the highest point, thus leaving a bottom deposit that cannot be scraped to the outlet in the center. The bottom of the digester slopes about 1 inch per foot toward the center, which is too flat for heavy material to flow.

In emptying the digester, the first step was to transfer a quantity of seeding sludge to the second-stage digester, to be available when needed. This was done by gravity through the regular sludge transfer lines. Next, the material not needed for seeding was drawn onto the sludge drying beds. By using draw-off lines at different levels it was possible to dispose of scum and much of the digested sludge on the sand beds. The manholes on the digester were kept open during the drawing operations to help ventilate the tank. After disposing of as much material as possible by gravity, the pumps were started and the rest of the digester contents were pumped into the incoming sewage.



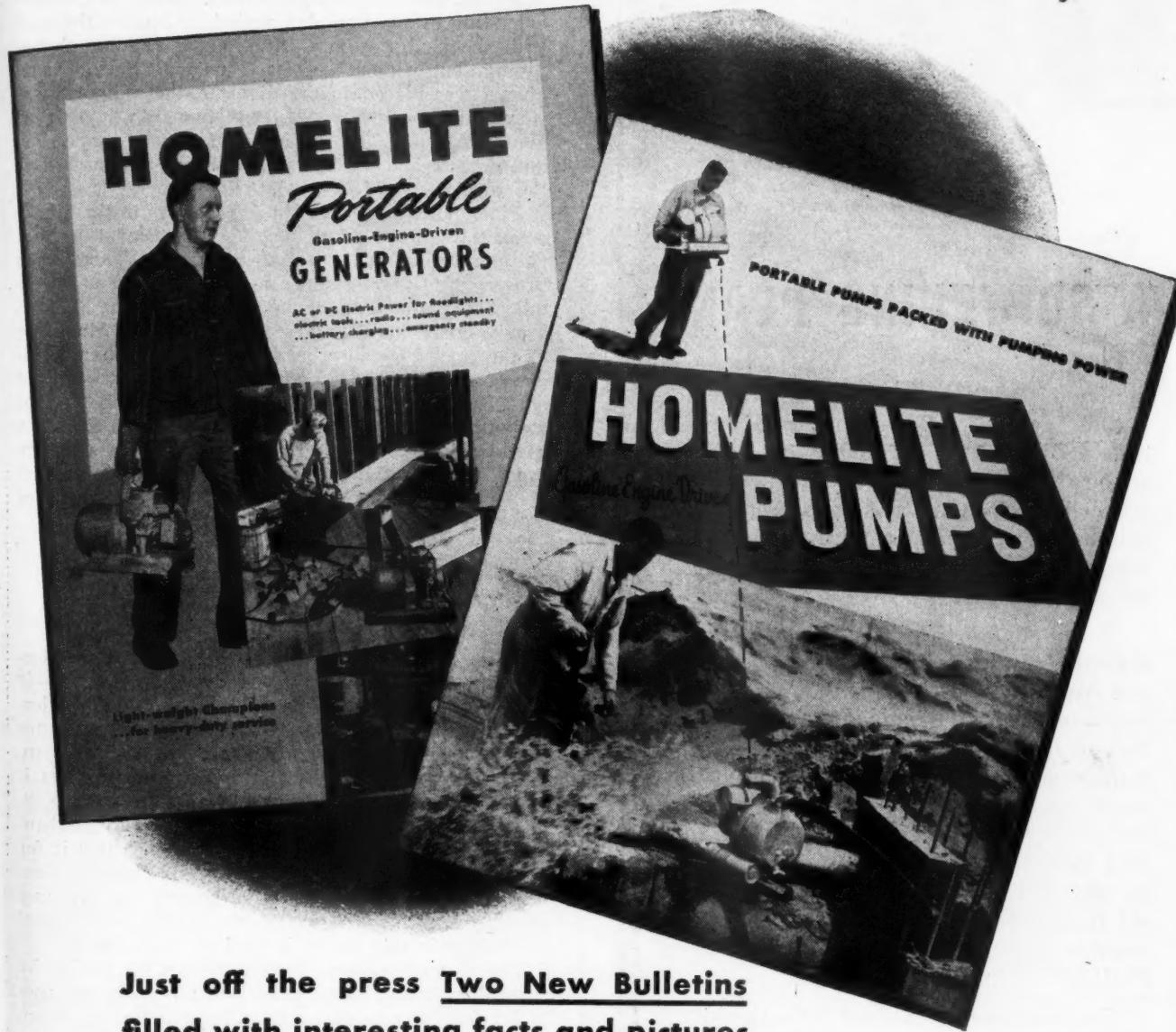
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Case History No. 7



WM. H. SCHNEIDER,
Supt. and Chemist
Water Filtration Plant,
Fremont, Ohio

A SOFTENING PLANT

The City of Fremont, Ohio, located on the Sandusky River in North Central Ohio, in the year of 1928 designed and built a water softening plant to handle 3,000,000 gallons of water per day. The plant was planned to soften and purify the very flashy Sandusky river water, with a turbidity reaching 3,000 p.p.m. and hardness up to 660 p.p.m.

The plant was of a conventional design, employing Lime and Soda Ash for softening and Alum for coagulation. Trouble was encountered in forming a satisfactory floc in the colder months, especially with high turbidities. As the city grew and the demand increased, it was necessary to find a remedy for this condition, and after running laboratory tests indications were that an iron salt would give better results. An old feeder was converted so as to make it possible to run a plant scale test, using FERRI-FLOC.

The conclusions reached from this plant test prompted our purchasing new feeding equipment suitable for feeding FERRI-FLOC. As a result of this change, we have secured a more satisfactory finished water throughout the entire year.

Our thanks to the Technical Staff of the Tennessee Corporation for their assistance in solving our problem."

(Signed) WM. H. SCHNEIDER

TENNESSEE CORPORATION
Manufacturers of Ferri-Flac
ATLANTA, GEORGIA LOCKLAND, OHIO

The tank was left out of operation, with all of the openings clear, for about 24 hours. The warmth of the tank, acting with the cold outer air, set up adequate ventilating currents, and made mechanical ventilation unnecessary. The interior of the digester, with the mechanism, piping and other parts, was thoroughly hosed down with a fire stream, and workmen entered the tank for inspection. It was found at once that a heavy sediment covered the bottom. Efforts were made, extending over a four day period, to remove the stuff with the sludge pumps through the regular sludge piping, but without success. Finally a Savage sand ejector was placed in the digester, the sediment was shovelled into piles, and fed by hand into the ejector. Water was supplied through a fire hose connection, and the material was elevated from the tank as fast as the workmen could feed it into the hopper.

Plans now in preparation for changes in the Ithaca sewage treatment plant include grit removal, as well as improved sludge handling equipment. There is no prospect that the digester can be levelled, so as to permit perfect alinement of the scrapers, but the elimination of grit should be of great advantage. Handling of the grease has also been changed, and the expedient of placing grease on the surface of partly dried sludge is now being tried. There is a possibility that a sludge filter and incinerator may be installed, which would solve the problem of grease disposal. In any event, the operating difficulties so far experienced are being thoughtfully considered in the preparation of future plans.

Methods of Sludge Disposal

(Continued from page 30)

away; the florists in Northhampton utilize it for fertilizer; Phoenixville "gives it away if possible—if not, it is hauled to the dump"; Pottstown and Souderton also disposes of it on the dump, but the latter city also sells some of it. In South Carolina, the city of Clinton "throws it away," while Sumter gives it to the farmers for fertilizer. Sludge in Aberdeen, S. Dak., is utilized for fill; Madison hauls it to an abandoned pit and Rapid City grinds it and uses it for fertilizer in the city parks. Of the six cities in Tennessee which reported, Alcoa is the only one replying to our question in regard to the method of disposal of sludge; in that city it is used on park lawns.

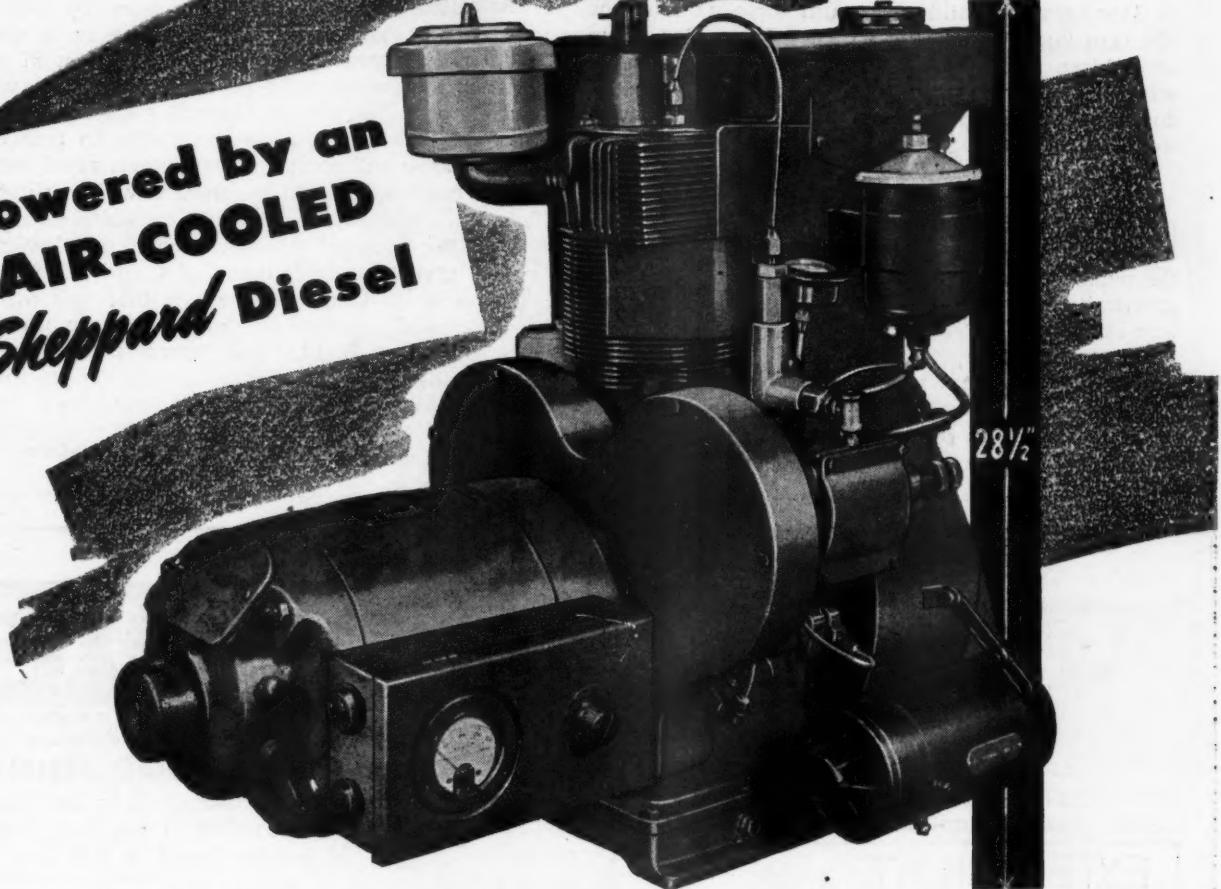
The city of Albany, Texas, utilizes the sludge by spreading it over city-owned land; Big Spring uses it for fertilizer in parks after being ground; Bryan and Nacogdoches also use it for fertilizer, in the latter city on the airport, golf course, etc.; in Brownwood the sludge is hauled away, but some of it is wasted. Columbus piles the sludge outside the plant; Denton buries it; in Gainsville it is put on adjoining farm lands and Giddings piles it in the pasture; it is put on an open dump in Lamesa; Temple disposes of it by plowing it under in the fields; Uvalde burns it; in Waco and Weslaco, it is sold for fertilizer, and the cities of West University Place and Wichita Falls give it away, the latter to farmers and to the Park Department.

In Virginia, the city of Front Royal gives the sludge away for fertilizer; Harrisonburg wastes it; and it is sold to farmers in Marion. One city in Washington—Ephrata, gives the sludge to farmers.

Sludge is sold for fertilizer by the following cities in Wisconsin—Baraboo, Clintonville, Green Bay, Oshkosh, Rhinelander and Two Rivers; and Fort

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dependability and low-cost maintenance... are now available in a small power plant. Its compact, rugged design... its air-cooling... its smooth operation... make a Sheppard 2 K.W. Generating Set equally adaptable for stationary or portable use.

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Atkinson, Janesville, South Milwaukee, Viroqua and Wausau each report that the sludge is used for fertilizer, Fort Atkinson specifying it for use in parks and on lawns, and Janesville for golf courses. In Kenosha it is used as soil conditioner in parks, and in Richland Center by the city in parks and cemeteries, some being sold to private individuals; Delavan reports no method, except that it is hauled away; it is removed by truck in Shawano for lawn conditioning, and in Sparta it is given to farmers or used for lawn dressing. Wisconsin Rapids is installing drying beds and expects to sell the sludge.

Fluorides in Water Reduce Dental Decay

The War Relocation Authority records in regards to 316 Japanese children furnish some data on the effects of fluorides in water on tooth decay. One group of children lived for 3 years in California, using a water supply containing approximately 0.1 p.p.m. of fluorine. The second group lived in Arizona and used well water containing almost 3 p.p.m. of fluorine.

The diets served in the two relocation centers were adequate and quite similar, and the children received periodic dental examinations. Study by the United States Health Service of the data obtained showed that the number of caries-free teeth per 100 children was practically identical for each of the two groups, when first examined in 1943.

When examined again in 1945, it was found that the control group (those using water practically free of fluorine) had a much higher percentage of "new teeth, decayed, missing, or filled," than the group consuming water with a fluorine content of 3 p.p.m.

The advantage of the high fluorine water varied with the age of the group.

The conclusions reached by the United States Public Service are that the findings should not be interpreted as an endorsement of an addition to public water supplies of as much as 3 p.p.m. of fluorine. They do conclude, however, that the addition of small amounts of fluorine to community water supplies deficient in this element effects a reduction in caries incidence in the erupted permanent teeth of school age children, and that the improvement is most noticeable in the teeth of the younger children.

Activated Silica For Treating Paper Mill Waste

So-called activated silica produced by partially neutralizing sodium silicate solutions in a specific manner, is receiving considerable attention in paper mills in the treatment of process water, white waters and in waste coagulation. Generally employed in conjunction with alum it has the ability to reduce the alum dosage and form a more compact rapid settling floc. When employed in conjunction with settling and flotation type systems operating on white waters, the added floc density permits higher overflow rates, hence, greater unit capacity. An added advantage of its use in flotation devices is that this material does not add decomposable organic matter which increases effluent B.O.D. and promotes slime growth. The use of silica in conjunction with the precipitator type of clarifier shows considerable promise from a number of standpoints and is now under development at a board mill in the East.



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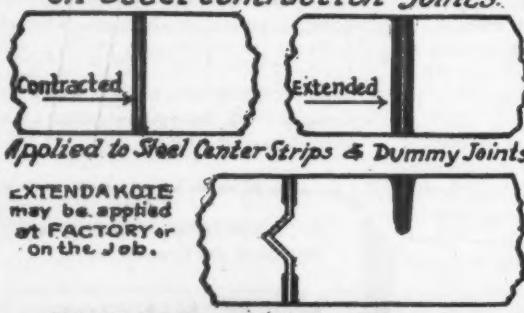
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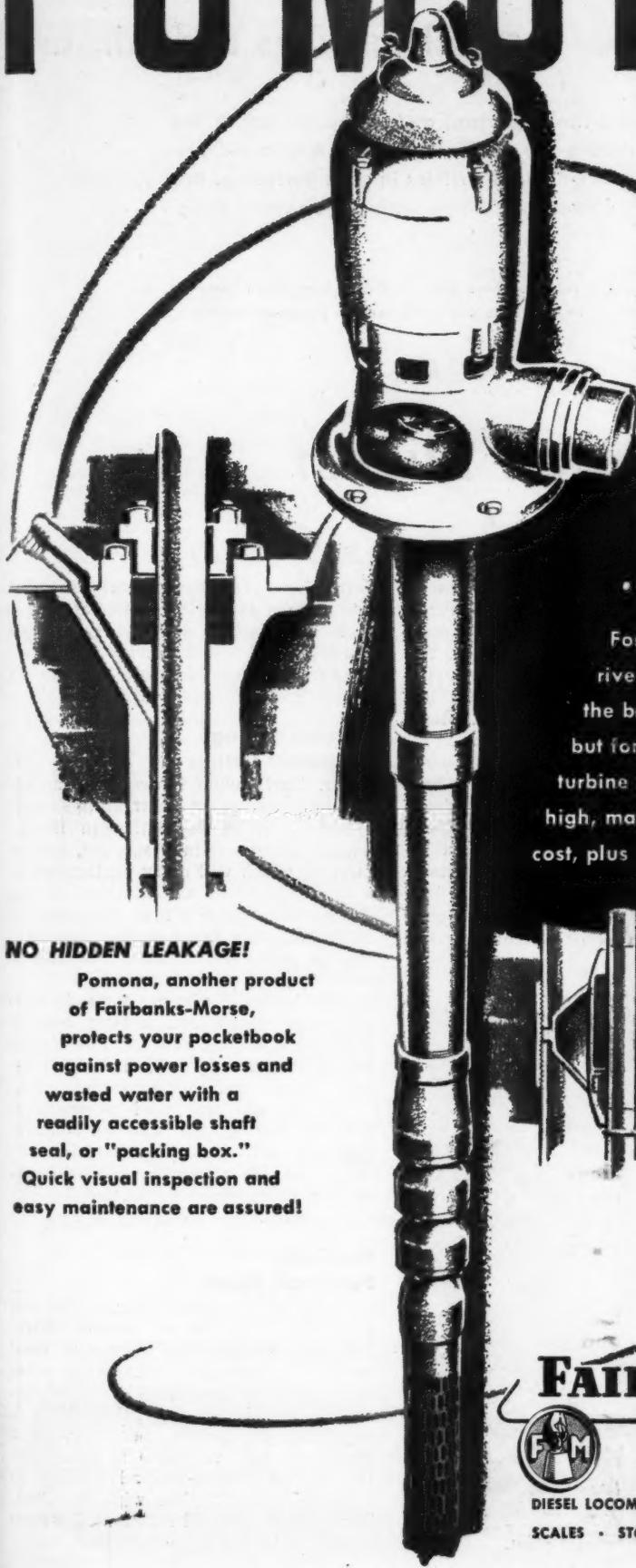


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Fairbanks-Morse vertical turbine pumps are built in sizes from 4" to 36"—with oil or water-lubrication—semi-open or enclosed impellers.

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Public Works Digests

Water Supply • Sewerage • Highways and Airports

In this section are digested and briefed the important articles appearing in the periodicals that reached this office during the previous month. Appended are Bibliographies of the principal articles, in which the articles in each periodical are numbered consecutively throughout the year, beginning with our January issue.

The letter and number at the end of each digest refer to those used in the Bibliography. Numbers not found in the current Bibliography will be found in the one published the previous month.

The Sewerage Digest

Use of Digester Gas

In most of the large sewage treatment plants of Germany, the digester gas is compressed into steel cylinders for use as fuel in municipally operated automobiles. In Germany, gasoline is expensive as it is produced artificially from coal and digester gas can compete with it on a cost basis, though less convenient to use. For use in automobiles the gas may be liquefied, or drawn directly from high-pressure steel cylinders, or from bags containing it at atmospheric pressure. In steel cylinders, it is usually compressed at 3,000 p.s.i. The amount of sewage produced by the entire population is insufficient to furnish the

amount of gas wanted and some gas is obtained by the digestion of manure. The dry stable manure of one cow mixed with straw will yield 88 cu. ft. of gas, containing 60% methane. In one plant the digester is 42 x 16 x 11 ft. deep, provided with a mixer. Most of the digested matter floats and is removed from the outlet end daily and used as fertilizer, the quantity being about half that of the original manure. The overflow liquor, used as liquid fertilizer, contains considerable nitrogen. Both are practically odorless. There is a loss of fertilizing value, but no more than in applying the undigested manure directly to the land, for the same bacterial decomposition and gas

formation take place in manure piles and on the land. It is calculated that such digestion of half of Germany's stable manure would provide in the gas, a heat-equivalent as great as that of all the gasoline imported in 1934. ^{c2}

German Sewage Treatment Details

Dr. Karl Imhoff is designing an activated sludge plant for treating sewage from 1,300,000 population in Berlin, which is laid out in 9 sections, one or more of which will carry purification to a high degree of nitrification and the effluent from these will be circulated to all the entering raw sewage, thus making the septic sewage more amenable to treatment and minimizing odors.

Practically all digester tanks in Germany are heated, and rotating heating coils are common; external raw sludge preheaters and removable internal heating coils are used to some extent.

Sewage gas was used as much as possible during the war to conserve gasoline, and was compressed in two stages to 14 atmospheres, washed to remove CO₂, then compressed to 350 atmospheres. ²²

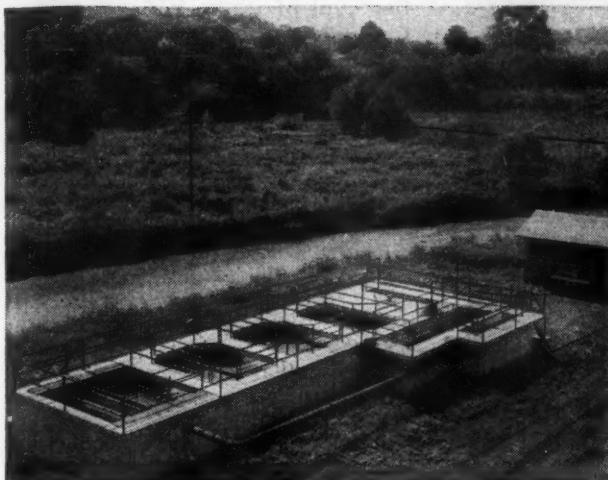
Elutriation For Small Plants

As a plant becomes smaller, the net profit from the use of vacuum filters and elutriation decreases, until at some point it disappears. What that point is, varies with conditions but is seldom as low as 15,000 population. With a population of 20,000 there may be a saving of \$400 to \$800 in chemicals. In addition, there are advantages in the elimination of lime with its odors, incrustation and acid reaction of inhibitors.



Floating cover digesters at the Greenville, S. C. sewage treatment plant.

Stops STREAM POLLUTION--- AND Saves NEARLY A TON OF PULP *Every Day!*



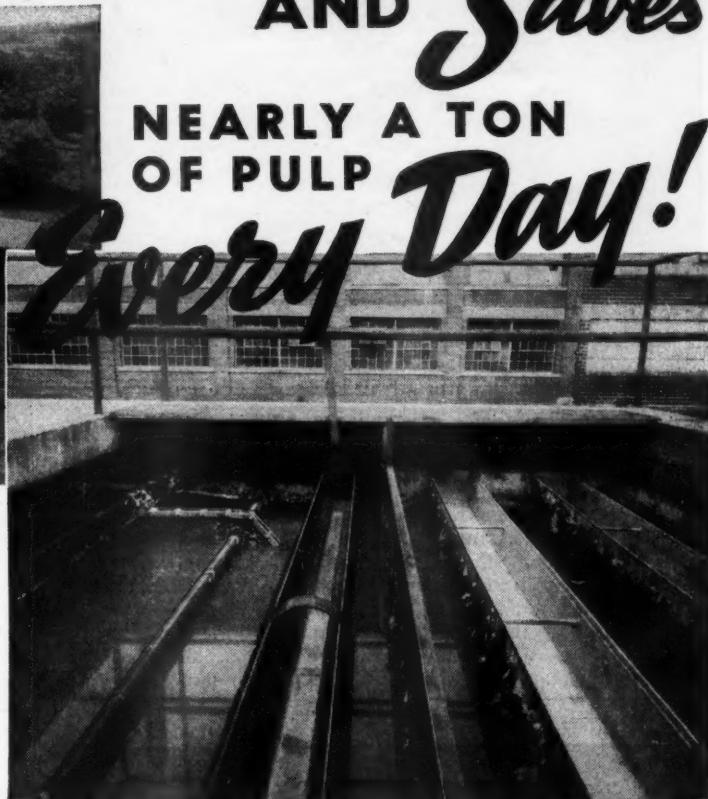
General view of Link-Belt Sludge Collector and Chemical Slow Mixer installation at Beach & Arthur Paper Co., Modena, Pa.

LINK-BELT SLUDGE COLLECTOR RECOVERS 90% OF SOLIDS FROM "WHITE WATER"

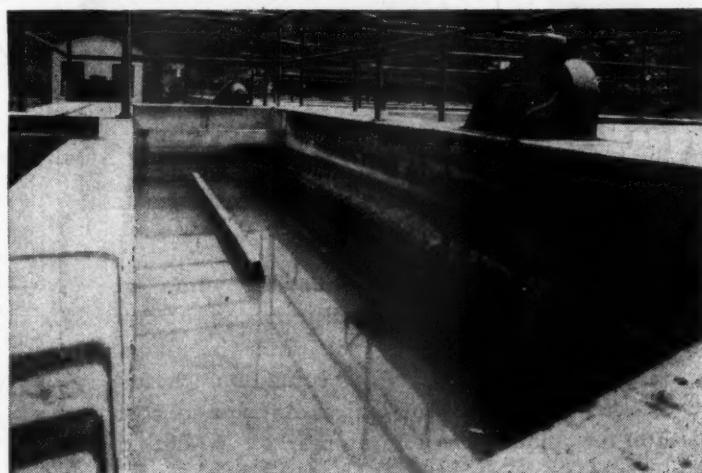
State laws which prohibit discharging factory wastes into streams, point attention to the need for the efficient Link-Belt Straightline sludge collectors, scum skimmers and slow mixers. Many industries find this equipment enables them to conform to legal requirements and at the same time recover valuable solids, otherwise unavoidably lost in waste water.

Pictured here is an installation at Beach & Arthur Paper Co., Modena, Pa.; one of several mills similarly equipped by Link-Belt, along the historic Brandywine Creek. 450,000 gallons of waste water are handled at the Modena plant each 24 hours, from which 1800 lbs. of pulp are recovered.

Sludge collectors and slow mixers are part of a comprehensive line of conveying, screening, power transmission and preparation equipment, engineered and built by Link-Belt Company.



Settling Tank for the settling of coagulated wastes; showing one flight, chain, sprocket and shaft of L-B Sludge Collector; Roto-line scum skimmer; baffle board and troughs for run-off of treated waste water. Water level lowered to show equipment.



Mixing Tank for coagulation of chemicals and waste; contains one L-B slow mixer.

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities. 10,218

MATERIALS HANDLING AND CONVEYOR EQUIPMENT

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Columbia, Mo., 2.5 mgd activated sludge sewage treatment plant.

The total space required for elutriation settling varies from 0.02 to 0.2 cu. ft. per capita, the higher figure resulting from thin sludge and a short operating schedule; also, an increase in the alkalinity of the wash water from 150 p.p.m. to 300 would necessitate increasing the tank space by 50%. In

general, if the filter is operated 8 hours or less a day for 5 days or less a week, treating well digested sludge averaging more than 6% solids and water of low alkalinity, a continuously operated single tank may be cheaper to install than an intermittent tank for 30,000 population or less; for 20,000 or less,

a single fill-and-draw tank may be preferable. If the sludge contains less than an average of 5% solids, and plant effluent is used for washing, the companion counter-current tank system may be cheaper to install and operate.²³

Removal of Clean Grit

Racine, Wis., treats an average of 11 mgd of combined sewage in a plant of 48 mgd design capacity. The grit chambers were divided into two channels originally, but to give velocity of flow through them of more than 0.5 f.p.s., one channel was divided into two, each 9'4" by 40' long and 33" deep, giving velocity of 0.5 ft. at minimum flow and 1.0 ft. at maximum. "Rex" grit removers collect the grit, raise it out of the sewage and deposit it in hoppers, from which it is conveyed to a washing unit and then used for fill adjacent to a public park. To prevent nuisance it was necessary to remove practically all putrescible matter, and even with reduced width of channel the volatile matter in the grit removed averaged 65.9%, and the putrescible matter 8.5% varying from 5.9% to 14.4%. To lessen this, the plant has been changed so that when the grit contains more than 2% putrescibles, the unwashed grit is returned to the sewage and again passed through the grit chamber at times when flow velocities



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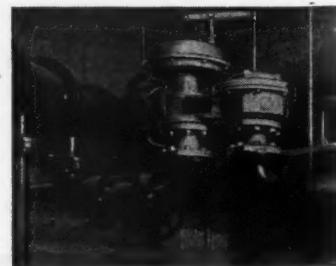
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unnecessary cuts in the street

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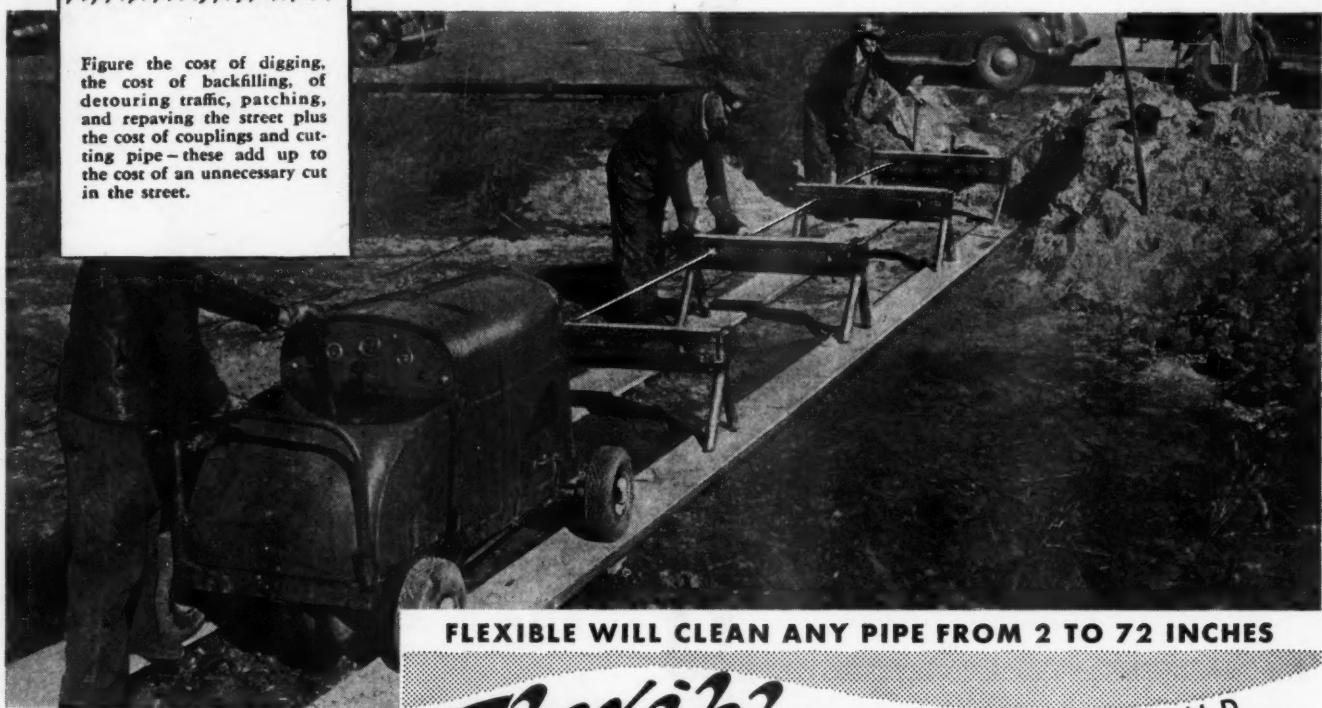
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are such as to minimize the deposit of putrescibles; then all the grit is washed in clean water forced upward through it. This reduces the putrescible matter to 1.3%, or 15% of what it was before recirculation. During some tests the recirculation alone reduced the putrescible matter 79% and this and washing combined reduced it 93%. No grit is contained in the effluent from the grit chambers; two sludge pumps have been operating 15 to 20 min. each hour for 7 years and only one piston has had to be replaced. In 1944 the cost of operating and maintaining the grit chambers was 50.5 cts. per mg., or \$1,869; of which \$1,401 was for labor in operation, \$285 for supervision, and \$183 for repairs and paint.

From this experience the author gives five items of prime importance for proper grit removal: (1) Hydraulic design must be sound, with special attention to minimum flow. (2) The equipment should be so designed as to maintain the hydraulic conditions and handle the solids in such manner that they follow the theoretical laws used in design. (3) The equipment must be flexible so that the operator can meet changing conditions. (4) The grit collectors should be designed so that they are in proper balance with other units of treatment. (5) The units must be operated intelligently. ^{CS}

Digested Sludge As Fertilizer

The Connecticut Agricultural Experiment Station has studied the value of sewage sludge as a fertilizer in pots in greenhouses, using sludge from New Haven, Middletown and Hartford. From these, the conclusions reached were that the sludge serves principally as a soil conditioner, improving its physical condition and increasing its water and nutrient-holding capacity. Immediate increases in crop yields from the use of sludge can hardly be expected under all conditions and with all crops. It is not a balanced plant food and it is imperative that adequate supplies of potash be provided in addition, particularly for those crops with high potash requirements. From the standpoint of yield of the first crop as well as that of possible health hazard, sludge should be applied at least several months prior to planting. Supplementary applications of nitrogen can be made to advantage at planting time. ^{CS}

Rate of Flow of Sludge

At the sewage plant of the Elizabeth Joint Meeting, the sewage is passed through coarse screens, comminutors, grit chambers and settling tanks and the sludge is concentrated in tanks,

pumped to a barge and transported to sea. The cost of transportation is based on the volume of sludge barged, hence on the degree of concentration. In 1944 149,000 tons of sludge was collected. This was reduced by concentration to 80,805 tons with 8.2% total solids. If this could have been concentrated by storage to 9.2% solids, the cost would have been \$4,500 less for the year. With greater concentration, the sludge flows more slowly and requires more pump pressure to force it through the 4,000 ft. of pipe to the barge, but this has been more than offset by improvements in operation (recirculation, use of air and water, etc.) and in equipment (removal of obstructions, larger pumps, etc.). Temperature has more effect than concentration. At an average temperature of 53° the velocity of sludge flow was 1.30 f.p.s., and at 72.5° it was 2.59 f.p.s., and the head pumped against was 21 ft. compared to 40 ft. at the lower temperature. ^{CS}

Plant Use of Effluent Water

The West Haven, Conn., treatment plant formerly paid about \$1300 a year for public water for use about the plant. Since 1940 it has used plant effluent instead. This is used to serve two chlorinators and to wash down the three

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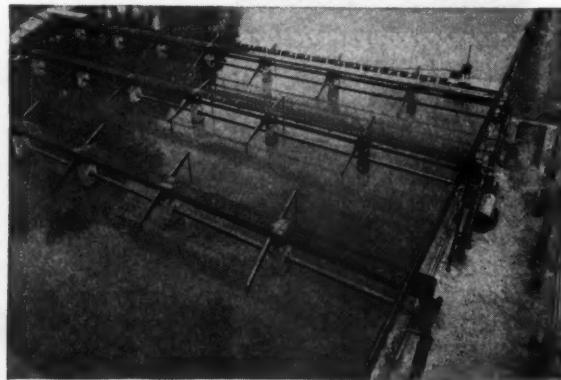


Illustration above shows STUART-CARTER mechanisms in operation at the Moores Bridges Water Purification Plant, City of Norfolk, Virginia.

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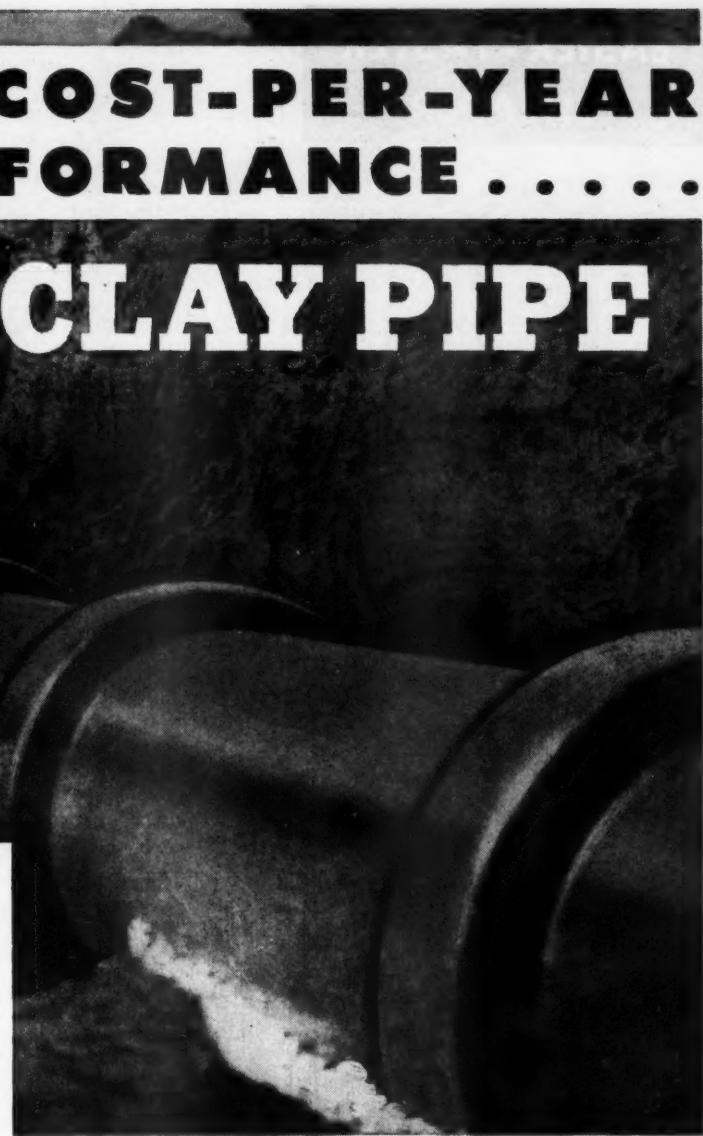
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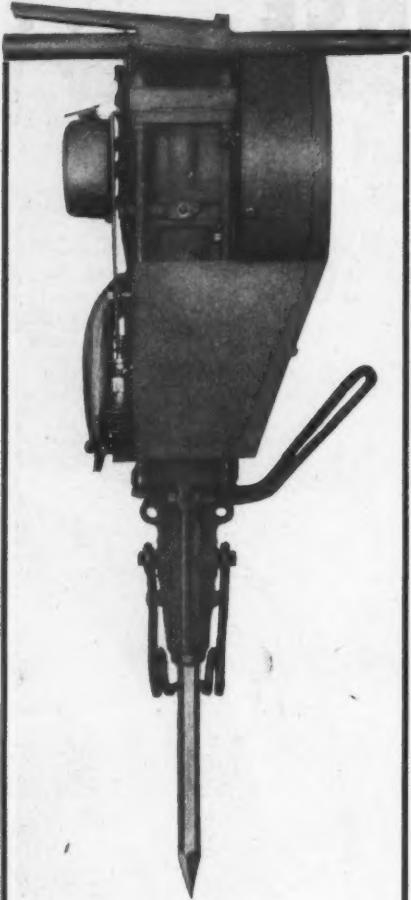
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from one of the regional association offices,
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Write for Bulletin 8-45

SYNTRON CO.
660 Lexington, Homer City, Pa.

settling tanks daily and for breaking up the sludge in a converted Imhoff tank. The total so used amounts to about 4 mg a year. The cost of installing the water system was \$1400. The public water bill has been reduced from \$1300 to \$720. The net saving in five years has averaged \$500 a year.

The water is taken from the effluent channel of the settling tanks through strainers, that for the chlorinators being a screen with mesh of about 200 perforations per sq. in. It is pumped by a 1 1/2" centrifugal pump into a pneumatic pressure tank controlled by a "Nu-Matic" air and water control tank. C11

Bibliography of Sewerage Literature

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2. Digester Gas for Automobiles. By Karl Imhoff. Pp. 17-25.
3. Small Sludge Elutriation Plants. By A. L. Genter. Pp. 26-45.
4. Preliminary Greenhouse Studies of Digested Sludge as a Fertilizer. By Herbert A. Lunt. Pp. 46-53.
5. Experience in Grit Removal and Handling at Racine, Wis. By Thomas T. Hay. Pp. 54-65.
6. Operation Efficiency and Factors Affecting Operation at the Elizabeth Joint Meeting Plant. By Willem Rudolfs and Edward P. Decher. Pp. 66-81.
7. The Toxicity Thresholds of Various Sodium Salts Determined by the Use of Daphnia Magna. By Berth G. Anderson. Pp. 82-87.
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11. Use of Effluent Water in Sewage Treatment Plants. By Robert Burrell. Pp. 104-109.
12. Administration, Operation and Maintenance of Sewage Disposal at Cleveland, O. By J. W. Ellms. Pp. 113-121.

**D The Surveyor
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2. Industry Converts Sewage Works Effluent Into Water Supply. By Wm. P. Hill. Pp. 383-390.
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6. German Water and Sewage Plants Examined by U. S. Technicians. Pp. 133-135.

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12. Detritus Settlement Possibilities for Small Sewage Works. Pp. 23-24, 36.
13. Making Fertilizer From Refuse and Sewage Sludge. Pp. 31-32.
14. Postwar Problems of English Sewage Works. P. 34.
15. DDT for Mosquito Control. P. 34.
16. Sewage Gas for Motor Vehicles. P. 39.
17. Effect of Winter on Sewage Plants. Pp. 41-42.

Useful Booklets and Data

Marlow Pumps, Ridgewood, N. J. A new bulletin describing Marlow *power-driven diaphragm* pumps in 3 and 4-inch single and 4-inch double sizes, with capacities from 3,000 to 10,000 gals per hr. These "Mud-Hogs" are used for pumping water, mud, sand, ooze, slush, gumbo, slime and grit.

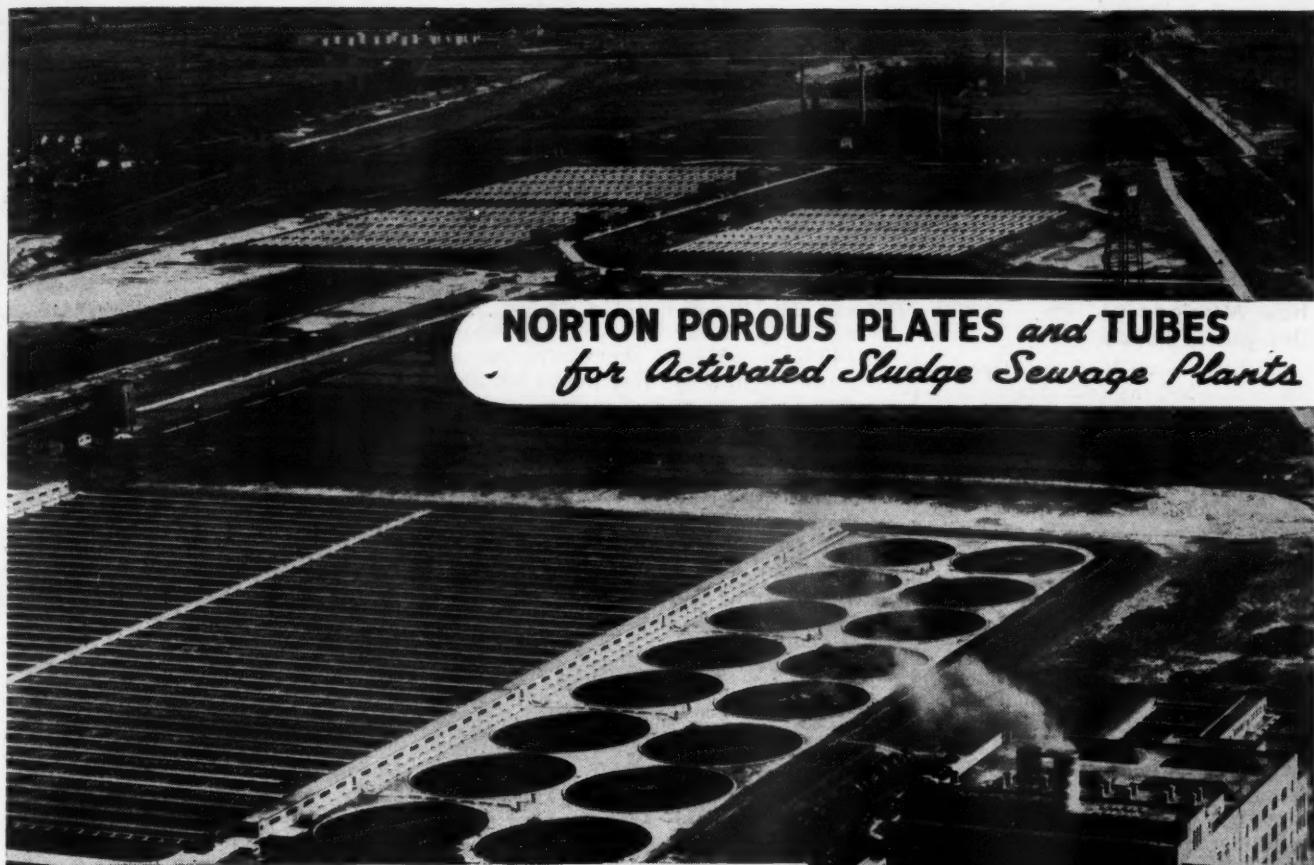
Chain Belt Co., Milwaukee, Wisc. Bulletin No. 480, which describes the streamlined 65 *concrete mixer*, the Rex 3 1/2 S end discharge mixer, and the Rex Skipper. Small sketches of machine innovations emphasize improvements.

Master Builders Co., Cleveland, Ohio. Data on a new film *Concrete Facts*, which tells the story of cement dispersion, a new development that improves concrete and promises lower construction and maintenance costs. Cement dispersion and air-entrainment are shown to increase the durability of concrete as much as 5 times. The data are based on studies conducted at Ohio State University and two years of tests.

Ralph B. Carter Co., Hackensack, N. J. An excellent new bulletin, No. 4505, on *Mechanical Processing Equipment for Water Purification and Sewage Treatment*. Mechanical mixers, clarifiers, rotary distributors; sludge pumps, digesters, centrifugal pumps, siphons and flocculating equipment are described.

Opportunity Unlimited—A guide for veterans interested in the construction industry. This 56-page booklet was prepared by the Committee on Opportunities for Veterans, of which E. L. Chandler is secretary. It is a product of representatives of a large group of organizations. It covers: 1. A bird's-eye view; 2. If you are returning to a construction job; 3. If you are interested in a trade; 4. If you want trade training; 5. If you want to start a business; 6. If you are interested in a profession; and 7. If you are an employer. It is quite general in nature, a necessity due to the wide field it covers. Copies are 10 cents from Mr. Chandler, 1026 17th St., N. W., Washington 6, D. C.

Airport Accounts—This is a publication by the Municipal Finance Officers' Assn. intended to fill the gap in airport accounting literature. There are 28 pages of a carefully and completely worked out accounting system for both large and small airports, with each account title explained in full. \$1.25. Order from Municipal Finance Officers' Assn. 1313 East 60th St., Chicago 37, Ill.



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The Highway and Airport Digest

How Michigan Designates Roads

Michigan State Highway Department has established the following considerations as a basis for selecting the principal secondary and feeder roads for receiving federal aid: Spacing them 3 miles apart in the better agricultural areas; 4 miles in those sparsely populated; 3 miles one way by 4 the other where practicable; one-mile spacing where there are urban developments on the fringe of large cities. Natural barriers and irregular locations of communities may necessitate divergences from the standard. Usually a large lake requires a principal road around it, and a wide river requires a principal road on each side. Diagonal roads that serve much traffic have to be included; also spurs to principal secondary routes necessary to reach consolidated schools, institutions, parks, etc. Also to be considered are the traffic flow and the general land-use characteristics.¹⁸

Graded Stone Soil Stabilization

A type of road base common in New Zealand and found very efficient and economical consists of graded stone placed in two layers. The mixture is approximately 1 part clay binder, 1 part fine sand, and 3½ parts hard, angular stone. The bottom course, 3"-4" loose depth, all passes a 1½" mesh; the

top, 2½" loose depth, all passes ½" mesh. The material passing 50 mesh (45% to 65% of the whole) has a tensile strength in briquettes of not less than 15 lb. per sq. in. and lineal shrinkage of not more than 5%. The briquettes, moulded at field moisture equivalent, are oven-dried at 110° C for 24 hours or air-dried for seven days. For the bottom course the 10-mesh to 1½" material (60% to 75% of the whole) is spread first and covered with the 25% to 40% of fine material, dampened, harrowed, graded to shape and thoroughly rolled. Then the top course is similarly placed and rolled. Runways made in this way in North Wales have carried heavy bombers for four years with negligible maintenance requirement.¹⁹

Airport Accounting

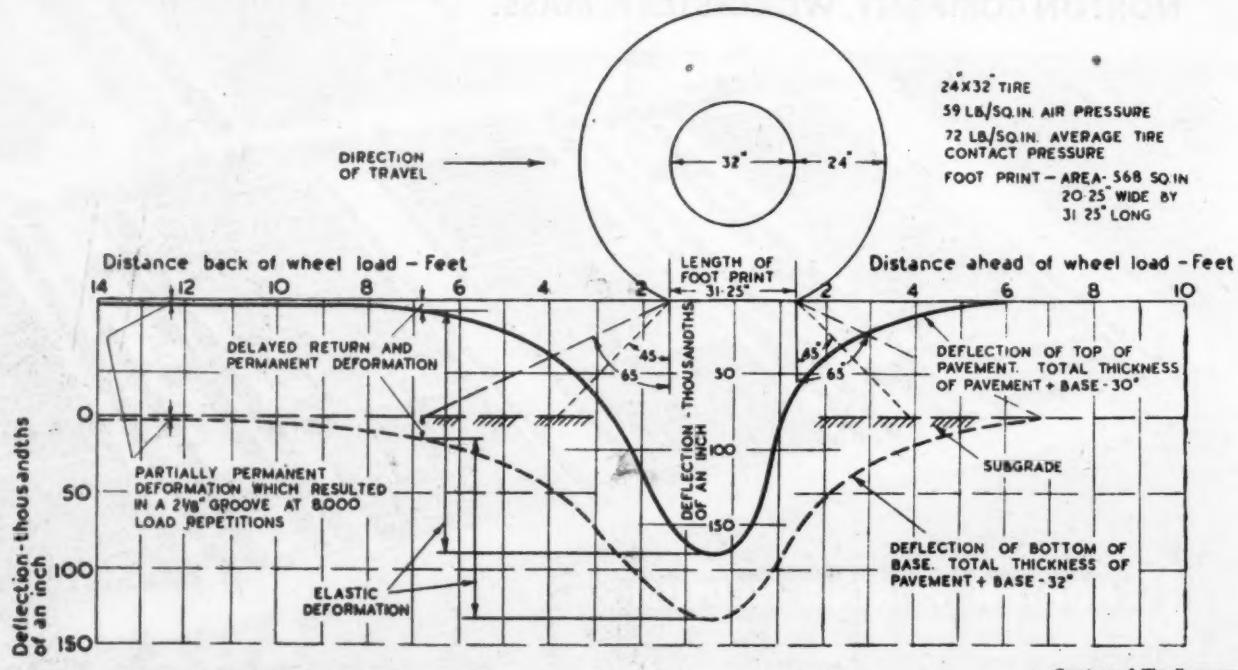
The chief aim in airport accounting should be an accurate determination of profits and losses. The author classifies revenues as follows: *Aviation revenues*—Hangar rental; scheduled flight fees; non-scheduled flight fees (airline companies, governmental agencies, local flying and other); other aviation revenues; and terminal building rentals. *Concession revenues*—Airport services; sale of petroleum products; land transportation facilities; terminal services; terminal sales. *Airport management sales*

and services, *Miscellaneous revenues*.

Expenses he classifies as *maintenance and repair* of field area, hangars, lighting and communications, seaplane walls and floats and channels, public areas (roads, walks, parks and parking areas), terminal buildings, and service equipment; cost of management sales and service; and general and administrative expenses. It is recommended that accounts be operated on an accrual basis; that taxes and services received from other city departments be paid for.²⁰

Soil Mechanics And Road Foundation

A road consists of an elastic layer or series of layers overlying and reinforcing an elastic subgrade medium. A pavement may be considered as consisting of a pavement layer with a modulus of elasticity E_1 resting upon a weaker subgrade material with a modulus of E_2 . The higher the ratio of E_1/E_2 , the more effective is the distribution of pressure over the subgrade. For rigid pavements, this ratio varies from 1,000 to 5,000; for flexible pavements it varies from small values to 2,000. The largest variation in E occurs in the modulus of elasticity of the subgrade. The subgrade is not perfectly elastic, and ultimate failure of a pavement is believed to be due to the cumulative effect of the small permanent deflection in the subgrade caused by a succession of traffic loads



Typical curves showing longitudinal pavement deflection under a moving wheel load of 40,000 lbs. at 10 mph.

Courtesy of The Surveyor

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Primary and secondary roads took a terrific beating during the war years. Hundreds of thousands of miles are in desperate need of maintenance; other thousands of miles are almost equally in need of widening and resurfacing. No single machine can perform *so many* of these jobs *so well* as the "99-M."

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and therefore depends upon the number of passes of traffic over the particular spot in the pavement. A narrow road tends to concentrate this effect on two narrow wheel tracks; an addition of a foot or two in width permits lateral dispersion of the wheel tracks and so may double or triple the number of vehicles required to produce failure. The more nearly the subgrade is brought to ultimate compaction during construction, the less the deflection, both instantaneous and permanent, caused by traffic. In fact, the subgrade may ultimately become almost perfectly elastic.

But this condition may be prevented and the deflection under traffic increased

by the presence of more than the optimum content of moisture. This may have been caused by rain during construction; but more often is due to moisture from above leaking through cracks or other permeable spots in the pavement, to surface or subsurface water entering through the sides, or to water from below. The first two are preventable by keeping the pavement impermeable and by side ditches or drains. The causes and prevention of the third are still speculative. Such moisture movement may be due (1) capillarity; (2) a breathing action of air in the soil; (3) temperature gradients in the soil; (4) stresses in the soil. Because of the diffi-

culty of displacing small bubbles of air, complete saturation of the soil by capillarity alone seems improbable. Movement of air into and out of the soil due to daily and seasonal variations in temperature and barometric pressure tend to saturate this air with subgrade moisture, which is deposited on the under side of the pavement when the air rises. Moisture tends to move from a hot to a cold soil, downward in summer and upward in winter, and the latter brings up moisture to the under side of the pavement. Similar air movements may be due to alternate application and removal of pressure in the subgrade by traffic. Moisture so deposited under the pavement near the edges may be removed by horizontal capillary movement to the shoulders and evaporation from these, explaining the fact that subgrade under the center of the pavement are generally moister than under the edges. When water just under the pavement freezes, the soil in contact with it is dried and absorbs water from below, as described above; this in turn freezes, and so the freezing works progressively downward, usually in the form of a series of ice lenses. This action is confined to relatively coarse-grained cohesive soils, whose pores are sufficiently large to permit the water to rise easily.¹⁴

Thin Concrete Pavements in Wyandotte

Wyandotte, Mich., has been laying 5" concrete pavements (7-5-7) and finds them successful and saving in cost. Estimating the subgrade bearing power at 20 psi they calculate that such a pavement will stand an unlimited number of stress repetitions of wheel loads up to 7,000 lb., and 4,250 repetitions (170 a year for 25 yrs.) of a 10,000 lb. load. The pavements are built with integral curb and gutter, the curb sections being shaped as the slab is finished by notching the finishing machine screed to conform to the curb cross-section. Expansion joints are placed at the intersections only, and contraction joints at 15-ft. intervals. The contractor for last year's work used a Rex single-drum mixer, and a Butler bulk cement batcher between two Johnson bins.¹⁵

Joint Spacing in Seattle

It is the experience of Seattle, Wash., that the expansion joint is the point in a concrete pavement where trouble is most likely to occur. Hence they increased the spacing between joints in 1926 from 20 ft. to 40 ft. and then to 45-60 ft. with dummy joints at 15 ft. intervals. In 1927 a 456-ft. section was laid without any expansion joints, but with transverse dummy joints at 15-ft. intervals, which is still in good condition; and in 1935-36 two sections were built, one 860 ft. long, the other 640 (each a day's run), with no expansion joint except between the two, which are still in excellent condition. "The City Engineer's office of Seattle is of the opinion that the elimination of all ex-



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pansion joints will result in concrete pavements far superior to those constructed with short expansion joint spacings, and that, as experimental work is continued and the findings are published, the results will be the elimination of all expansion joints in this locality." Present specifications call for spacing of approximately 300 ft. where the slab is on earth subgrade.

In 1942 there were 34 blowups of concrete pavements, and in every case this occurred at short-spaced expansion joints where the joint face was not perpendicular to the subgrade. It is believed that concrete pavement slabs have their maximum length when first laid and that dummy joints at 15 ft. spacing

open enough by contraction to provide for later expansion. The problem is to prevent these from filling with dirt when the slabs contract.¹¹

Armor-Piercing Shells for Blasting

In making a 20-mile road and airport runways on the island of New Britain in the Pacific, the Seabees used a volcanic slag for surfacing material. Such quantities had to be provided so quickly that ordinary quarrying methods with drills were unable to provide stone to keep the more than 100 trucks that were hauling the material busy 24 hrs. a day. The method finally adopted was to fire

75 mm armor-piercing shells from a Sherman tank into the face of the pit; which made horizontal holes 10" in diameter and 10 ft. deep. These were cleared out with long-handled shovels and charged with dynamite. An average of 20 holes a day brought down enough loose material to keep three power shovels busy 24 hrs. a day loading it into the trucks.¹²

Cost of Federal Aid Secondary Roads

The estimated costs per mile of the roads that the several states propose to build under the federal aid secondary programs vary from less than \$5,000 to over \$100,000, most of them being of the bituminous type. The maximum and minimum of several of the states are as follows: Alabama, \$7,000 to \$15,000. Arizona, average \$19,400. California, a maximum of \$100,000 for a 4-lane divided highway. Delaware, \$7,000 to \$40,000. Georgia, \$15,000 to \$20,000. Kentucky, \$8,500 to \$35,000. Maine, \$30,000 average. Massachusetts, average of \$80,000. Minnesota, \$4,500 to \$75,000. Nevada, average \$12,000 to \$15,000. New Mexico, average \$20,000. North Carolina, grading and drainage, \$4,000 to \$15,000; stabilizing base courses, \$2,000 to \$12,000, light bituminous treatment, \$3,000 to \$6,000. Oregon, average \$25,000. Pennsylvania, average \$110,000, including structures. Texas, average about \$9,000. Virginia, average \$4,000. Washington, grading and surfacing, \$19,000; grading and paving, \$34,000; bituminous surfacing, \$6,400. West Virginia, \$5,000 to \$40,000. Wyoming, average \$11,000.¹³

Air Entraining Concrete Road in Indiana

A 6-mile reconstruction project on route 24 laid in 1945 was a first try-out of Indiana's new 3%-5% air limit specifications for air entraining concrete. It consisted of 2-lane reconstruction 22 ft. wide, using 9"-7"-9" wire mesh-reinforced concrete on a sand base, with no expansion joints; contraction joints at 40-ft. intervals. The sand base was rolled to 95% compaction. The subgrade was given one continuous slope of $\frac{1}{8}$ in. per ft. transversely across the entire pavement and extending a foot or more into the shoulder on each side, with a 6" drain pipe along the lower side. For about 2 miles the new pavement was placed as a 5" to 6" recap on an old concrete pavement 18 ft. wide, extending 2 ft. wider on each side with a 9" overhang. Subgrade paper was placed on the old pavement to prevent the new concrete adhering to it. Subgrade under the "overhang" was rolled to 100% compaction, and the concrete here was reinforced with $\frac{1}{2}$ " bars 3 $\frac{1}{2}$ ft. long spaced at 2-ft. intervals.

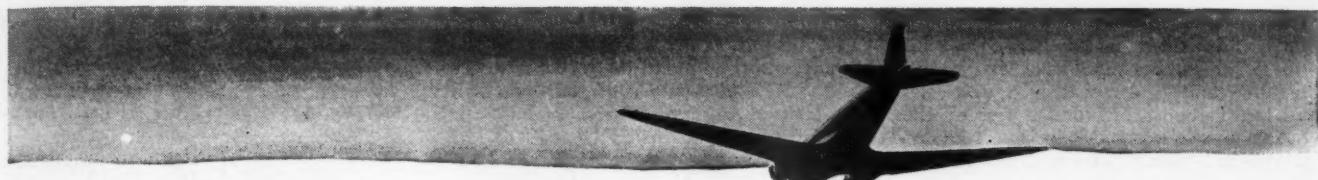
The equipment used included a mechanical ditcher, 2 motor graders, a tractor-drawn finegrader, longitudinal power float, strip machine for dummy joints, bridge for placing a 6" iron



One of the many exclusive features of the Frink is that it eliminates the snow packing itself into the adjoining snow as it is carried to the side. This prevents side thrust. The snow is first raised on the forward portions of the moldboard, above the level of the banks, before it is carried to the sides. Write today for more detail on the Frink special features.



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"I hear a man can fly half-way across the country nowadays in four hours.

Funny . . . it takes me almost that long sometimes to haul my crops twenty miles to the railroad siding. Nasty weather I can't get there at all—the road's that bad. Progress?

Sometimes I wonder . . ."

Maybe you've wondered, too, about the condition of America's country roads. These roads—2,400,000 miles of them—serve 6,000,000 farms. They link rural Americans with their schools, churches, markets, neighbors. Yet, more than half of them have no surfacing of any kind, and over one-third are still classed as *primitive*.

True progress calls for planned maintenance and improvement of this vital road network. Barrett Tarvia*, a serviceable and economical road tar, can help—as it has helped in the past.

Why not discuss your road problems with the Tarvia field man?



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oxide center stripe, wooden vibratory float, 34-E dual-drum paver making 60 to 80 batches an hour. Air-entraining portland cement was used, and each field test report included a test of the quantity of trapped air (percent of voids) in freshly produced concrete. ^{NT}

Gravel on Michigan Roads

In Antrim Co., Mich., the best cure for spring break-ups is a 6", 12" or 18" layer of gravel spread on bad sections. Also gravel is used for stabilization, combined with calcium chloride or tar. The county last September bought a portable gravel crushing and screening plant, which can be pulled out of a pit in 10 min., towed to another pit and

put into operation again in 2 hr. Most of the gravel will be hauled directly from the pit to the job, but stockpiles of 1,000 to 2,000 cu. yd. will be spotted in parts of the county for patching. On township roads, 6" of gravel are placed at a cost of about \$2500 a mile, usually stabilized with calcium chloride and clay admixture. Most county trunk highways receive a bituminous gravel surface of 6" minimum thickness, shaped with blades and primed with 0.3 gal. of T3 tar, covered with 10 lb. per sq. yd. of $\frac{3}{4}$ " max. screened gravel; followed by two successive applications of 0.3 gal. of T3 each followed by 28 to 30 lb. of $\frac{3}{4}$ in. gravel; then another 0.3 gal. of tar and $\frac{3}{8}$ in. stone screenings; each course thoroughly rolled. ^{NT}

Time-Tested for DURABILITY

Calcium chloride curing for concrete pavements is a reliable, economical and automatic curing method that speeds the work. It permits opening to traffic much sooner and adds to durability and wearing quality.



22 Years Old

Surface cured with calcium chloride in 1924, this Ohio road is in good condition today. Proper curing is important for durability of concrete.



23 Years Old

This concrete road near Harrisburg, Pennsylvania, was constructed in 1923. Two pounds of calcium chloride per bag of cement were used in the mix. It is in very good shape today.



20 Years Old

Integrally cured with calcium chloride in 1926, this concrete highway in Maine gives good service today with a relatively small amount of maintenance.



19 Years Old

Surface cured with calcium chloride in 1927, this New Hampshire pavement goes on performing the work for which it was constructed — traffic service.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Bldg., Detroit 26, Mich.

CALCIUM CHLORIDE
for BUILT-IN CURING

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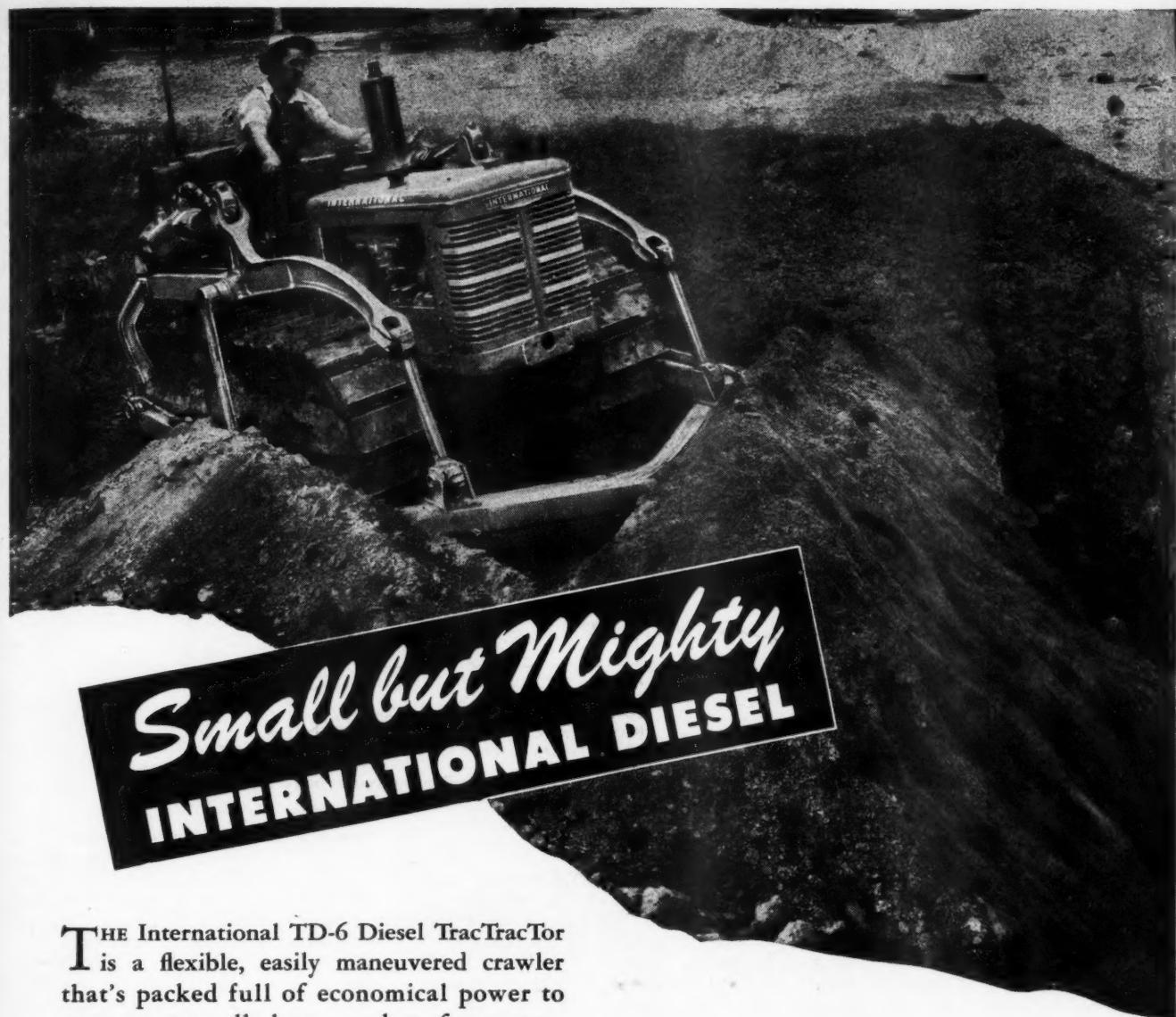
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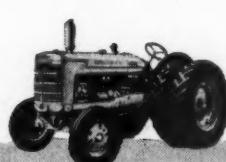
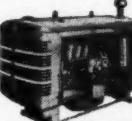
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The Waterworks Digest

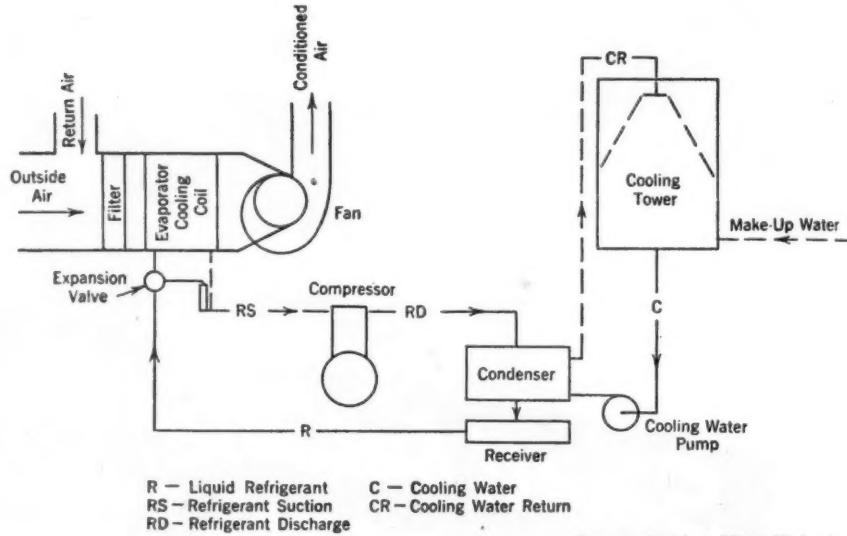
Air Conditioning and Water Conservation

Air conditioning is causing both water supply and disposal problems, and they may be expected to increase during the next few years. Waterworks superintendents, in cooperation with other city authorities, should examine the water plant and distribution system to be sure that complete plans are available, so that the ability to supply these increasing loads in various parts of the city may be determined quickly; they should determine the ability of the sewers and the sewage disposal plant to handle the increased amount of water; and recommend suitable ordinances regulating the use and disposal of water in air-conditioning systems before these problems become acute.

Generally, the cooling water should be recirculated through a cooling tower; but many small systems omit the cooling tower, using a continuous supply of fresh water instead, which is highly undesirable. Small-capacity cooling systems of 1 or 2 tons of refrigeration (requiring about $1\frac{1}{2}$ hp per ton to drive the compressors) can be purchased with air-cooled condensers, in which no cooling water is used. Where water is used, the cost of compressor power decreases as the amount of water used increases, and the relative costs of these determines what amount of each is most economical. At 10c per 1,000 gal. for water and 2c per kWh for power, $1\frac{1}{2}$ gpm per ton of refrigerating capacity gives the lowest operating cost. Approximately 90% to 95% of the water used may be saved by use of evaporative condensers or by recirculating the water through a spray pond or cooling tower. The former generally gives the lowest initial cost and operating expense.^{A33}

Reconditioning the Rochester Conduit

Rochester, N. Y., in 1876 put into service 50,000 ft. of 36" wrought iron pipe, riveted into 27 ft. to 81 ft. sections which were connected with leaded cast-iron hub and spigot joints. This was used until 1934, when 12 miles was abandoned because of leaks, many of them due to cracked bells and two more conduits laid to replace it. During war time Rochester's consumption increased beyond the capacity of these two conduits, and the first one was reconditioned and put into service. The pipe plates were generally well preserved, and it was decided to line it with $\frac{3}{8}$ " cement mortar centrifugally



Courtesy American Water Works Ass'n

Air conditioning system layout.

placed by the Centriline Corp., after thorough cleaning of the plates by the National Water Main Cleaning Co. It was found that the pipe was distorted throughout its length, the vertical diameter being short by as much as 7" in places. This prevented use of the regular machines of either company, and each developed a modified machine to meet this condition. The defective hubs were reinforced by steel bands or removed and replaced by steel sleeves. Work of lining was started Sept. 12, 1944 and completed Nov. 22. Cleaning and lining cost \$145,973; repairing leaks, \$28,220. After reconditioning, the pipe tested to a coefficient $C = 100$. A new 33" pipe with $C = 130$ would have carried the same amount of water and cost three times as much.^{A26}

Disinfection Of Small Mains

In chlorinating mains in London, England, which had been repaired after bombings, the method of placing hypochlorite at the end of each pipe was employed at first. This, using 10 ppm, was successful with the large mains but not with the small ones, partly because the latter have a complicated layout, are not laid to uniform gradients permitting draining, branch connections and service pipes are not reached, and the men in charge were not familiar with chlorination technique. Also the pipes were polluted by dirty water and not adequately cleaned. To remedy the last, the pipes and couplings to be used were

sprayed thoroughly with a solution of sodium hypochlorite, using a stirrup pump; and the main in the trench was sprayed internally by pushing the hose up it to its full length—30 ft. This was an improvement, but the results were not always satisfactory; partly, it was believed, because the jute in the joint became polluted and resisted disinfection.^{Y2}

Unaccounted-For Water in Kenosha

The Kenosha, Wis., water department makes accurate determinations of its unaccounted-for water. Both the low-lift and high-lift pumpages are measured through Venturi meters; the water used in the plant, for washing filters, etc., is carefully metered and subtracted from the low-lift meter reading and the difference checked with the high-life. (This checked within 0.03% in 1944). Water used in flushing dead ends, in sprinkling streets, flushing sewers, etc. is carefully computed (not guessed); that used from hydrants is metered. Adding this to the registration by consumers' meters left only 5.5% unaccounted for in 1944. In 1934 the unaccounted for water was 28.44%, but in 1938 a water waste survey was made which revealed a loss of 136,000 gpd by underground leakage, and 209,000 gpd under-registration of industrial meters, through which 37% of the plant output is sold. Old and inaccurate meters were replaced with new ones; old compound meters with batteries of 2" disc meters. As a



Over \$27,000 net saving in 7 years... with these LE ROI Engine-Generator units operating on "no-cost" Sewage Gas

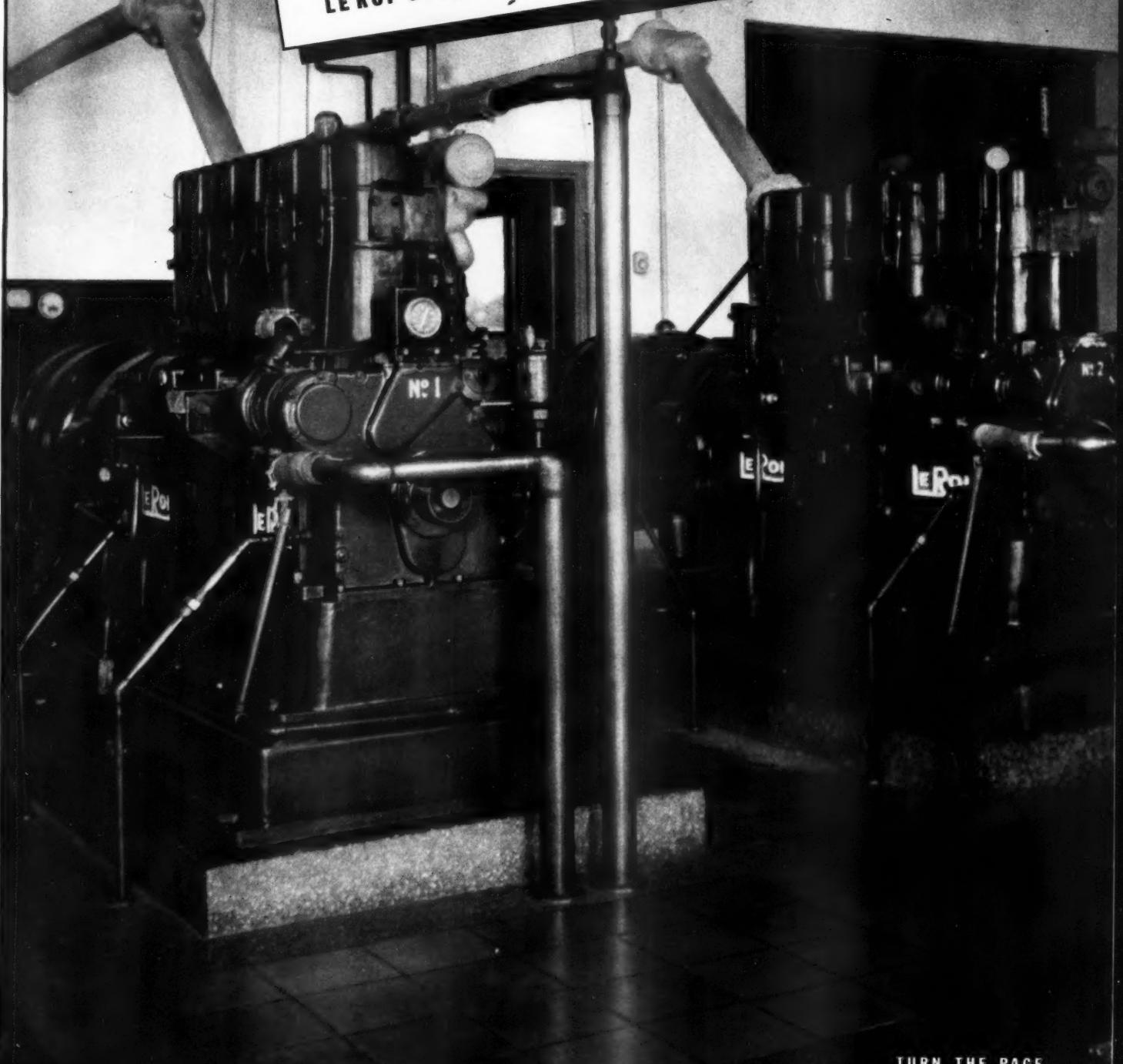
In the Oshkosh, Wisconsin, Municipal Sewage Treatment Plant, two Le Roi Engine-Generator units paid for their original cost in one year—and saved this city over \$27,000 in 7 years—by operating on "no-cost" sewage gas.

During this 7-year period, the public utility charge for 1,866,350 KWHrs. would have been \$37,205.03. The actual cost of this same power

generated by two Le Roi units was \$9,484.26 . . . a saving of \$27,720.77 . . . or a net cost of only 1/2 cent per KWH.

If sewage gas is available at your plant, simply send us the B.t.u. content and the cu. ft. available per hour, and Le Roi engineers will work out a practical, money-saving program. The necessary compression and carburetion are readily arranged. Write for bulletins.

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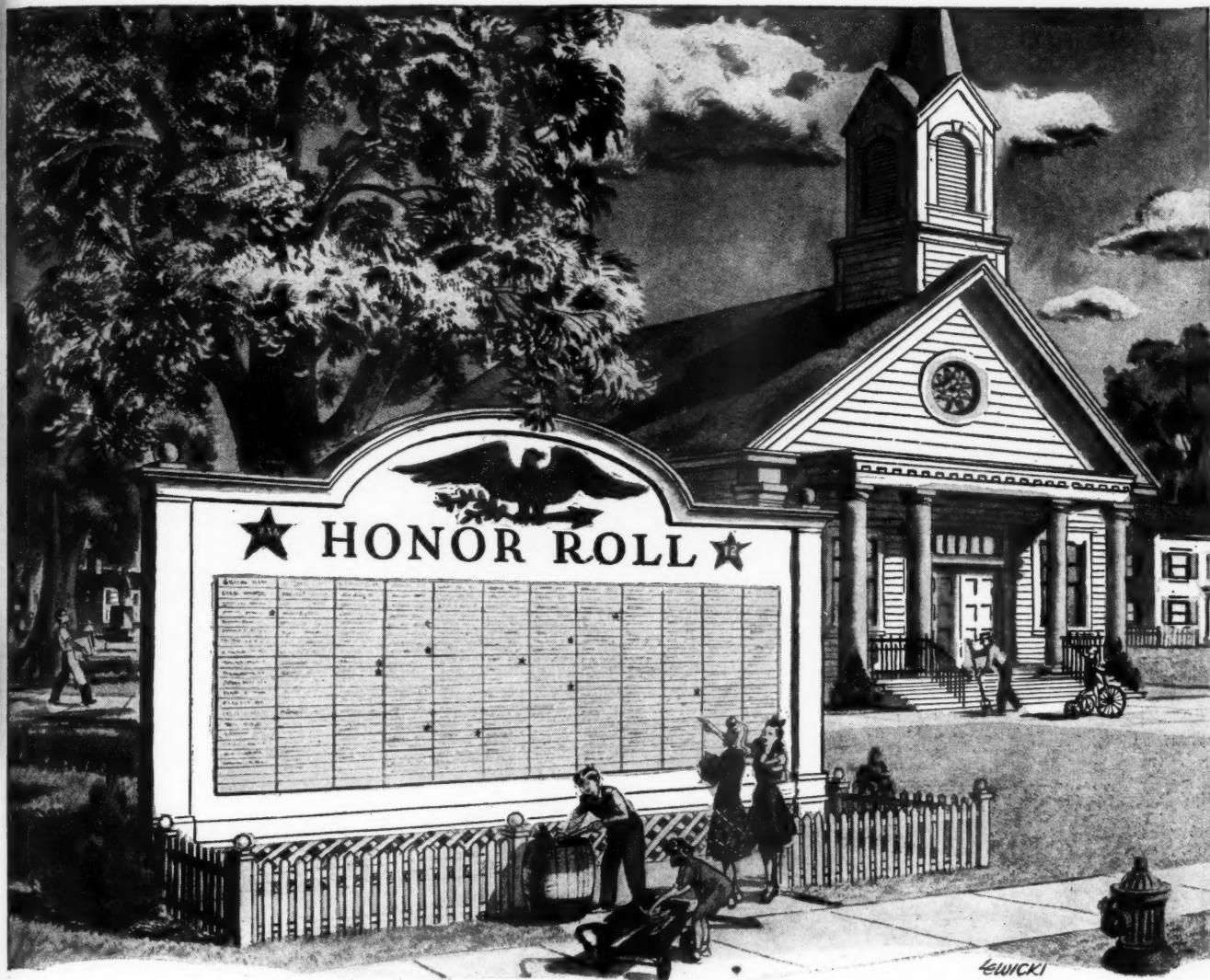
There are many reasons why Le Roi portable air compressors have achieved their world-wide reputation for thoroughly dependable air power—they are the only air compressors built by a leading manufacturer of industrial engines. The result is your four-way benefit: (1) Your compressor is built to the precision standards of an engine builder. (2) You get smoothness of operation. (3) You get the economy of assembly line production. (4) You get balanced, coordinated engineering and design.



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On water supply, sewerage and drainage projects the Lock Joint Pipe Company is prepared to come into your town, set up local temporary plants and

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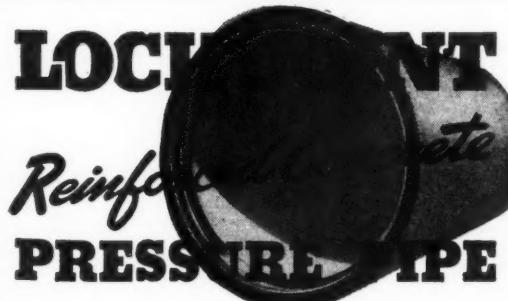
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result, in 1941 the amount received from metered sales was \$22,748 greater than in 1934, but the volume of water pumped was exactly the same.^{A34}

Checking Milwaukee's Distribution System

The distribution system of Milwaukee, Wis., covers an area of 45 sq. mi. and includes 1,000 miles of water mains. Eighteen years ago the Research Division of the Water Department was established, and through its annual pitometer and pressure surveys it has maintained an effective check on the operation of the system. It has 114 gauging

stations, so located that it is possible to measure the flows in the feeder mains serving various areas in the city and suburbs. The primary concern is the determination of maximum flows, which reach three times the average rate—four times in some districts. The Division has eight recording instruments and eight pitot tubes of various lengths for different diameter pipe. The 114 pitometer pits are enlarged manholes built directly over the main. In most cases the recorder is stationed behind the curb opposite the pitometer manhole and connected with it by a rubber connecting line laid in a $2\frac{1}{2}$ " conduit. The pitometer also locates water waste. Approximate

mately 85% of the total pumpage is paid for and a substantial portion of the remaining 15% can be accounted for by under-registration of meters, flushing and filling of mains, settling trenches and breaks in mains.

A pressure survey is conducted during the summer months as the most economical and efficient means of checking the adequacy of the service. Approximately 20 recording pressure gauges are installed at critical points, chiefly on hydrants, housed in steel boxes attached to the hydrant. From data so obtained, tables have been compiled which show the static and minimum pressures at practically every street intersection in the city. The pressure survey is also of material assistance in locating sources of water hammer in the system.^{A35}

Studies of The "Filto-Kleen"

This device is offered by various department stores and is claimed to eliminates 99.9% of impurities, fit any faucet, prevent splash and be rust proof. Samples were studied by two water examination laboratories, which found that bacteria multiplied in the device and the "filtered" water generally contained more bacteria than the unfiltered. It does "fit any faucet", prevents splash, and, as it is made of plastic material, it is not likely to rust.^{A36}

Some German Waterworks Practices

Many interesting features were found in German waterworks by Arthur E. Gorman and described in a paper before the A.S.C.E. Among them were the following: At Munich, a number of tunnels 7 ft. in diameter built into a hill intercepted veins of excellent water of 47° F temperature. In other places, iron was oxidized by causing the water to flow downward over staggered brick in a tower and removed by slow sand filters. Manganese was removed by passing the water over calcined dolomite filter media imported from Russia. Underground reservoirs were lined with glazed tile, and excellently lighted, far surpassing anything in this country. A unique feature of the distribution mains was the use of signs at strategic intervals on which were data for locating them.^{A37}

Standardization of The Saturation Index

The saturation index as a means of indicating the tendency of waters to either deposit or dissolve calcium carbonate has been accepted with a degree of reservation; but "it is believed that, with continued research and the correlation of theory with practice, the earlier estimates of its value will prove justified." Mr. Langlier presents, in his paper "efforts toward standardization and . . . consideration of additional equilibria involved in the lime process of softening and in certain other methods of water treatment." He presents stability diagrams for calcium and magnesium in natural waters at 25° C. and



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When frost heaves the earth, the Mathews protection case grows . . . up it comes in the ground . . . without disturbing the barrel, the member that contains all the working parts . . . and preventing the joint from breaking. As to the barrel: If damaged, it is drawn out and a spare barrel inserted . . . no excavating . . . no breaking of the pavement . . . no waste of time, with the attendant peril to life and property. As to the protection case: It's Sand-Spun (centrifugally cast) . . . purified in the process, freed of strains, strong, elastic.

And note these Mathews features: Oiled from the outside; nozzle raises or lowers; head rotates a full circle; leak-proof stuffing-box plate cast integral with the barrel . . . assuring dry, non-freezing operating thread; low-placed orifice, draining out all the water, preventing any freeze-up. These have made Mathews the preferred hydrant all over the world for more than 75 years.

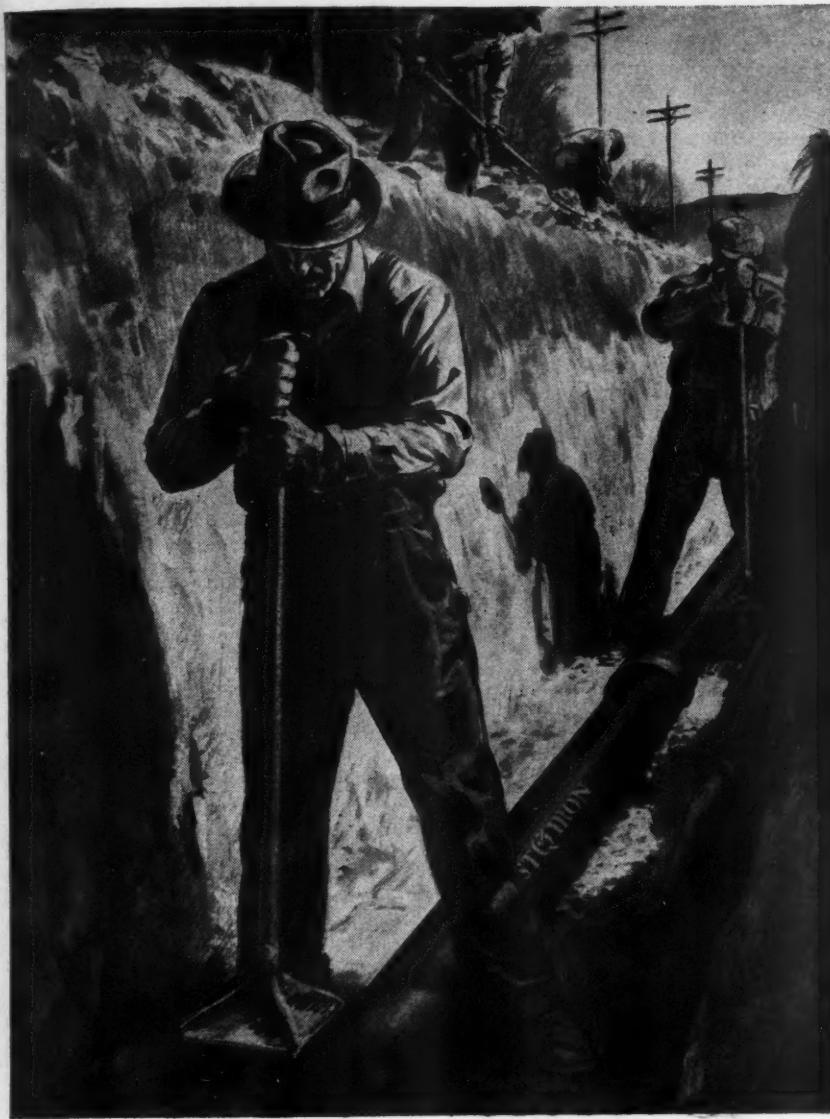


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A cast iron main, properly laid, comes as close to permanent construction as can be predicted in a changing world. Since its useful life is measured by centuries it need never be replaced except as a larger main is

required by population growth, and need never be abandoned should the line be re-routed because of shifting population. It will serve out its full span in the original location or elsewhere. And when it is just settling down to the prime of life, any bonds issued to pay for the installation will have long since been retired and forgotten.

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75° C., from which can be obtained the pH which a sample would possess if in equilibrium with calcium carbonate without change of its ionic components. The paper explores further the theory of the reversible pipe scaling process and extends the practical application of equilibrium equations to problems encountered in the laboratory control of various processes of water conditioning.^{A29}

Most pH testing equipment is standardized for use at or near room temperature, and measurements made at other temperatures may be very inconvenient or may contain significant errors; and the author describes the construction of

a diagram for the conversion of room temperature pH measurements of dilute carbonate solutions into values at other temperatures between 0° and 100° C. The data are intended for use in water softening and water pipe incrustation calculations.^{A30}

Chemical Weed Control

Aquatic weeds appear to be gaining headway in all parts of the country, and their presence in reservoirs is an important problem for waterworks officials. The use of chemicals appears to be the best method of controlling shore line

growths and all types of vegetation rooted in water but growing largely above the water surface. The use of chemicals for controlling strictly aquatic growths in water works reservoirs has been limited because of chemical tastes they may cause in the water and the possible destruction of fish. Some compounds used are poisonous, others must be handled with special precautions, and all should be studied carefully to determine their possible effects on water quality. Oiling, burning, raking, dragging and chaining have special applications, but generally such methods are only temporary expedients and are time-consuming and costly; the use of chemical methods is far more scientific and satisfactory. The waterworks man is interested also in the chemicals used on land around the reservoir, which might be washed into it. The tops of dams and the zone between high and low water level of reservoirs should be made sterile.

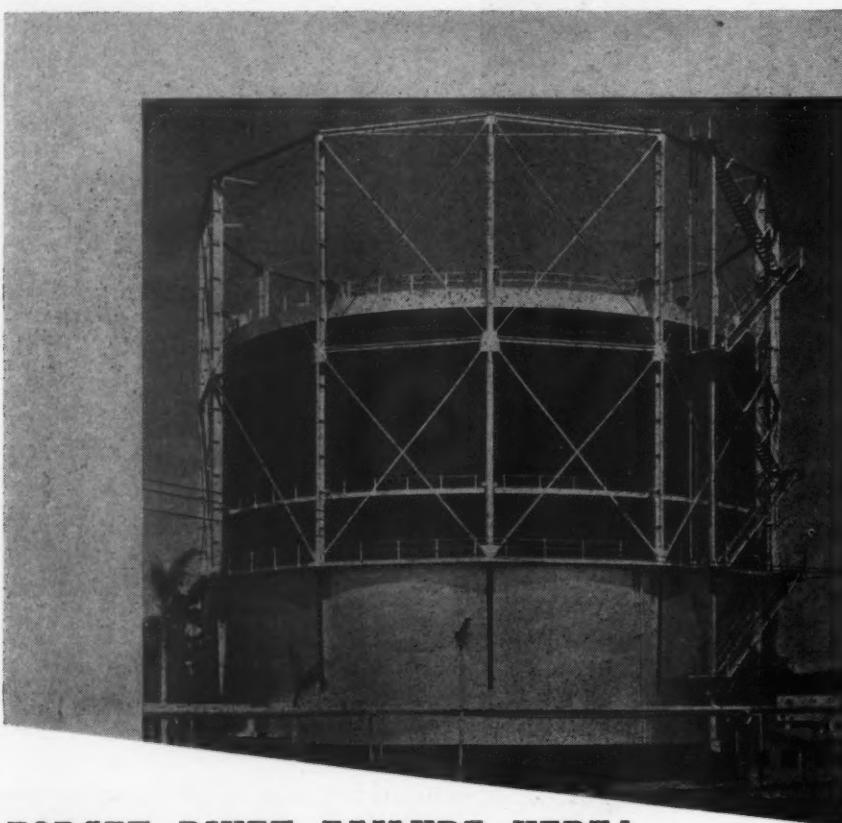
The author lists the following as chemicals used for controlling land weeds: Arsenicals, salt, sodium chlorate, sulfates, carbon bisulfide, borax, petroleum fractions, thiocyanates, furfural, ammonium sulfamate, and dichlorphenoxacetic acid. The last, called 2, 4-D for short, kills everything but grass. It is sold under various commercial names—"En-Dow-Weed", "Weed-Tox", etc.; some of which contain 45% dichlorphenol, which creates phenol odor in water. Sedges and rushes can be killed by cutting them off below the water line and treating with cloroben, copper sulfate or arsenicals, but 2, 4-D is the most successful for all but aquatic weeds. For these, sodium arsenite, copper sulfate, chlorine and benoclor have been used. Los Angeles, Calif., has found benoclor to be especially effective. It is not toxic to birds or animals but will kill fish if care is not taken in applying it. The cost is high, being \$137.50 per acre (using 50 gal. per acre).^{A31}

Removal of Cysts In Water in China

The Army in China was required to use highly polluted surface supplies, which it passed through sand filters made of 55-gal. oil drums, and chlorinated so as to maintain a residual of 1 ppm. Removal of encysted endamoeba histolytica was accomplished by pre-chlorinating to secure 2 ppm of free chlorine and holding the water 4 hr.; then coagulating, and filtering while some floc was still in suspension so as to maintain a surface mat on the filter, which was operated at one half the standard Army rate; and finally, native coolies were allowed to take no part in the distribution of the filtered water.^{A32}

Geophysical Logging in Illinois

Geophysical logging has become widely used in Illinois. During the past 15 years more than 200 resistivity surveys, ranging from just a few stations to nearly 1,000 stations, have been run in the state. Most of these surveys have



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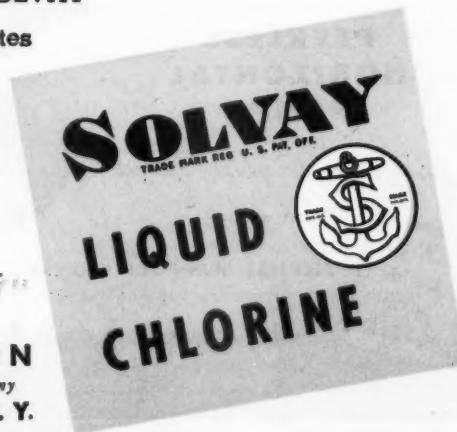
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led to successful development of water supplies in the glacial drift or have had their results corroborated by test drilling. The use of the resistivity method does not eliminate the need for test-drilling to guide development. However, through the years the use of the method has greatly reduced the number of exploration holes that need to be drilled and has reduced the need for the exhaustive exploration that is necessary in some areas before development can take place. Test drilling is necessary in order to obtain samples of the formation to be developed, samples of the water, and the data on the water levels, and to get a picture of the subsurface

conditions that affect well development. Most of the industrial and municipal wells logged are from 1,000 to 2,200 ft. deep; the expense of commercial logging cannot be justified for very shallow wells. Large increases in capacity have resulted in wells where the information for development of capacity was obtained from geophysical logs. Useless, contaminated or polluted wells, have been reconditioned and returned to useful operation. It has been found that the recognition of the best zone for shooting in one of the deep sandstone aquifers is more certain by electric logging methods than by sample examination or any other known method.¹⁷

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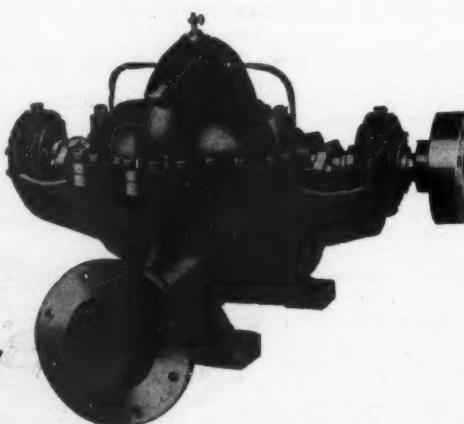
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**Philadelphia's
Proposed Water Supply**

A board of consulting engineers, after studying six projects proposed for furnishing a new water supply for Philadelphia, Pa., has recommended one estimated to be adequate to furnish 500 mgd for the city's population in the year 2,000. The recommended project is the one called the "Yardley-Walpack Bend." A dam 120 ft. high in the Delaware river, 13 miles above the Delaware Water Gap, would form a narrow reservoir about 35 miles long with an area of 15 sq. mi., receiving the run-off from 3720 sq. mi. This serves as a storage reservoir, from which water will flow in the existing river channel for about 75 miles to Yardley, 4 or 5 miles above Trenton, where it will enter a deep rock tunnel of 16.75 ft. diameter and 16.8 mi. long leading south to the Torresdale filter plant. Midway of this tunnel a pumping station would lift part of the flow through 13.2 mi. of 11 ft. tunnel west to a regulating reservoir, from which another tunnel would carry water south to the filter plants now treating water from the Schuylkill river, which river would no longer be used as a source of supply. The cost is estimated unofficially at about \$100,000,000.¹⁸

**Algae Control
in San Francisco**

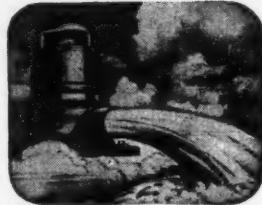
San Francisco's four reservoirs have a combined surface area of over 3,000 acres, and algae flourish in them in every month of the year. Treatment aims at prevention of heavy algae growths rather than destruction, using copper sulfate. Samples are taken at regular intervals at each reservoir, by means of a silk net, and examined qualitatively, and the total amount of algae per cubic meter of reservoir water is calculated. If significant numbers of any one organism are present, counts are made using a Sedgwick-Rafter cell. If the number exceeds a certain standard ([50 to 400] 10^4 per cubic meter for *Aphanizomenon* to [1500 to 3000] 10^4 for *Synedra*) copper sulfate is applied on a combined area-volume basis, using 10 lb. per acre plus 0.5 lb. per m.g. for the entire volume of water, giving from 12 lb. per acre in shallow sections, to 32 lb. in deep sections. These amounts are used for *Aphanizomenon* in summer, and are increased as much as 20% for organisms more difficult to eradicate, for suspended matter, or lower temperatures. Results have always been quite satisfactory. The copper sulfate is applied by spray equipment, that on the largest reservoir applying 8,000 lb. daily.¹⁹

**Waterworks Forests
in the United States**

More than 1,000 waterworks forests have been established around reservoirs and along streams and rivers tributary thereto. The Scranton (Penn.) Spring Brook Water Service Co., owns 70,000 acres, a large part of it timbered, from



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which it plans to secure enough revenue from cutting hardwood trees to plant it with the more desirable soft woods, since leaves from the hardwoods choke the filters. Little Falls, N. Y., has planted more than 2,500,000 trees on abandoned farms on its 5,000-acre watershed. It has obtained \$26,000 net from native hardwood stands, which are being replaced with soft wood. During the driest year in local history, although many lakes and streams were entirely dry, this watershed kept the city plentifully supplied. Westfield, Mass., has 5,600 acres surrounding its reservoirs, on which it has planted more than 750,000 trees since 1909, and has cut more than \$3,000 worth of fuel wood a year. At Canton, N. C., high school pupils have planted several thousand trees. Seattle, Wash., has planted about 4,000,000 trees on its 66,380 acres, and has received about \$1,000,000 from the trees cut.¹¹⁸

Cleaning Toronto's Reservoirs

Toronto's 50 mg. St. Clair service reservoir is cleaned and inspected annually. It is of reinforced concrete covered with earth and is divided into two chambers of equal capacity. The floor slopes to valleys leading to a 20" drain pipe. Laid along the tops of the dividing wall is a 4" water main from which a 2½" pipe leads to each chamber and along the dividing wall, fitted with connections for fire hose. When the reservoir is to be cleaned, the water is drained out and the water system is operated by direct pumping. Then the walls and roof are flushed off with fire hose and the floor cleaned with squeegees. At the same time a thorough examination is made of the condition of the concrete and joints, and any necessary repairs made. These have been confined to caulking with "Elastite" occasional minor deterioration of joints. The reservoir is then filled to a depth of 2 ft. and drained out; then filled for service and tested for purity. The whole operation usually requires a week. In this closed reservoir there is found only a little light sediment near the inlet.

The city also has an open reservoir of 30 mg capacity, and considerable amount of sediment (partly from algae) collects on the bottom and the sloping walls. This is cleaned thoroughly about every ten years, the work requiring a month.¹¹⁹

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D *Water Supply Problems in Alberta, Canada.* By D. B. Menzies. Pp. 227-233.

E *Training Plant Operators at Fort George G. Meade.* By Albert M. Tawney. Pp. 234-238.

F *Checking the Distribution System.* By Harry Breimelster. Pp. 239-243.

G *Studies of the "Filto-Kleen" Device.* By Harry E. Jordan. Pp. 244-250.

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I *January 4*

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12. Improvised Method of Grouting Leaks in Foundation of Dam. By Thomas B. Tyldesley. Pp. 71-72.

M *February 6*

13. Development of Water Works Forests in U. S. By Nelson C. Brown. Pp. 122-124, 155.
14. U. S. Aids Planning Water Works Projects to Cost \$50,000,000. By Harry Hewes. Pp. 125-126, 152.

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4. London's Water Supply. By E. F. W. Mackenzie. Pp. 353-357.
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News About People

Lloyd K. Clark, whose return to the directorship of the Division of Sanitary Engineering, North Dakota State Board of Health, was noted in the January issue, has resigned that position. Col. Clark will carry on research in sewage disposal for the American Association of Railroads, under the general supervision of *Abel Wolman*.

Stanley J. Carpenter, Lt. Col. Sanitary Corps., has been appointed entomologist for the National Biscuit Co., New York.

J. W. Simpson, vice-president in charge of sales of the Mueller Co., Decatur, Ill., has completed 45 years of service with that company. At a gath-



J. W. Simpson

ering of company personnel, Mr. Simpson was presented with a 45 year pin by W. E. Mueller, President of Mueller Co.

J. H. Elleman has been appointed manager of calcium chloride sales for the Solvay Sales Corp., succeeding *Geo. H. Kimber* recently made managing director of the Calcium Chloride Assn.

John O. Logan has been appointed an Assistant General Manager of Sales of the Mathieson Alkali Works; and *Harry P. Smith* has been appointed New York-District Sales Manager. Both will have headquarters at the New York office of the company.

William D. Jones has been appointed Division Engineer of Division 1 (New England, New York and New Jersey) of the Bureau of Community Facilities of the Federal Works Agency.

Harold F. Gerold, World War I army veteran and World War II navy veteran (Captain, CEC), has been made Division III engineer of the Ohio Department of Highways.

W. A. Hardenbergh of this magazine has been awarded the Legion of Merit for "achievements in organizing and directing the sanitary engineering program of the Army and for rendering contributions to military and civilian public health."

Capt. Conard W. Christenson, Sn. C. has returned from duty along the Stilwell Road in Burma and is expecting to resume his pre-war work in El Paso, Tex. Capt. Christenson did a magnificent job of improving army water supplies in Burma.

(More on page 67)

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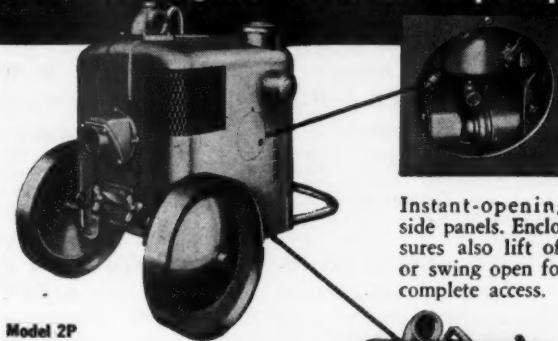
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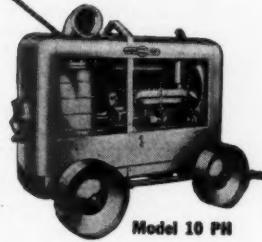
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A. C. Parker, city engineer of Tuscaloosa, Ala., has returned after 3½ years duty with the Civil Engineering Corps, U. S. Navy.

Carl M. Bennett, Director of Public Works and Planning of Ft. Collins, Colo., has returned after service with the Navy.

Walter B. Dunbar, Town Engineer of Stratford, Conn., has returned to his post after more than 5 years of military duty.

H. Berkey Bishop, formerly Major of Ordnance, has been appointed general manager of the Kotal Co., Summit, N. J.



J. J. Gilbert

Joseph J. Gilbert's return to Link-Belt Co. after 4½ years of service with the Army was mentioned in our January issue. The accompanying illustration of Col. Gilbert was not received in time for inclusion with that note.

L. M. Freedman has been appointed sales engineer of the Neptune Meter Co., with headquarters in Dallas, Tex.

James A. Lane has been transferred to the New York office of General American Process Equipment. *James F. Olsen* has been transferred to the Chicago office as manager of sales.

H. G. Sharp has been appointed general manager of the Graver Tank and Mfg. Co., East Chicago, Ind.

Fred D. Livingston, after 2½ years in the Navy, has returned to the position of sales manager of R. H. Shepard Co., Hanover, Pa.

Andrew K. Richardson, formerly city engineer and waterworks superintendent of Helena, Mont., has been appointed representative of Worthington Gamon Meters in the Chicago area. He recently completed 3 years service with the Navy, mainly in the South Pacific.

International Harvester Company has announced the following changes in personnel: *T. R. Moulder*, formerly assistant manager in charge of motor trucks, has been named manager of the new San Antonio motor truck branch; *C. T. Helin* has been promoted from assistant manager in charge of motor trucks to manager of the new motor truck branch at Houston; *E. M. Moore*, who has been retail motor truck manager, has been appointed assistant manager of the Houston motor truck branch; *M. J. Gowan*, previously assistant manager at the Cincinnati motor truck branch, has been made manager of the Richmond, Virginia, motor truck branch; *L. C. Carroll* replaces Mr. Gowan as assistant manager at Cincinnati; *C. V. Ellis*, who has been assistant manager of the Topeka branch has been transferred to the Kansas City motor truck branch in the same capacity.

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Progress Report on Investigational Concrete Pavements

There is now available a 108-page printed progress report, No. 3B of the Highway Research Board, describing the condition of investigational concrete pavement projects built in 1940 and 1941 in Kentucky, Michigan, Minnesota, California, Missouri and Oregon; and a report by the Public Roads Administration on "Structural Efficiency of Transverse Weakened Plane Joints."

The experimental features common to the six State projects consist of a series of plain and reinforced concrete sections in which the joint spacing is varied. The plain concrete sections have transverse contraction joints at relatively close spac-

ing (15 to 25 ft.) and expansion joints at 120, 400, 800 and 5281 ft. The reinforced sections have expansion joints at 120 ft. spacing with one intermediate contraction joint.

In general, load transfer devices were used in all expansion joints but were used in only part of the contraction joints of a given project in order to determine whether or not load transfer is needed with closely spaced contraction joints of the weakened-plane type. Several of the States included in their projects additional experimental features of design that were of particular interest to them.

During the time since these pavements were constructed, measurements and observations have been made of: (1) daily and seasonal variations in temperature,

PUBLIC WORKS for March, 1946

(2) daily, seasonal and progressive or permanent changes in the pavement, especially with respect to faulting at the joints, and (3) the general condition of the pavement and joints.

This report can be obtained from the Highway Research Board, Washington, D. C., for \$1.

Central Heating for Small Airports

The text presents the case for central heating at a modern airport center and demonstrates how this can affect the entire conception of airport design. It deals with a hypothetical airport of the size to serve the hundreds of medium and smaller sized cities in the country. An airport center strategically located on main highways and central to a number of municipalities could logically support retail establishments, amusement places, hotels, residences, and other activities. A central steam plant removes the objections of chimneys, smoke and soot. Detailed information consisting of photographs, blue prints, cost data, etc., is presented to show that such a project is economically feasible. Nationally known experts on airport planning and engineering have collaborated to assemble the material contained in the study. Major Jack Berry, Commissioner of the Cleveland Municipal Airport, has written the preface. Copies of the book are available to anyone interested in airport planning, upon request to the Ric-wil Company, Union Commerce Building, Cleveland, Ohio.

Clay Sewer Pipe Association

The New York Office of the Clay Sewer Pipe Association has been moved from 516 Fifth Avenue, New York City to Suite 2606, 26 Court Street, Borough Hall District, Brooklyn 2, New York.

The move to larger quarters was necessitated by the appointment of H. G. Carlson to the Association's field engineering staff. Mr. Carlson, District Engineer, will have his headquarters with Benjamin Eisner, Chief Engineer of the Association, at the new address. Principal headquarters of the Association are located at 1105 Huntington Bank Building, Columbus 15, Ohio.

New York Section, A.W.W.A.

The Spring meeting of the New York Section, A.W.W.A., will be held at the Mark Twain Hotel, Elmira, N. Y., on March 28 and 29.

American Hard Rubber Acquires Saran

The American Hard Rubber Co., New York, has acquired the Saran Division of the Hodgman Rubber Co., permitting an expansion of facilities and an extension in the field of plastics manufacturing. American Hard Rubber Co. will now manufacture, in addition to Saran, lucite, polystyrene and other thermo-plastics. S. J. Smith, a chemical engineer with the company for many years, will be in charge of the Saran Division.

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2. Jaeger air compressors, made in sizes 60 to 500 cu. ft.; trailer, truck, tractor and stationary mounted, gas, Diesel and electric power. Catalog and data. The Jaeger Machine Co., 400 Dublin Av., Columbus 16, O.

Bins and Batching Plants

11. Good illustrations and useful data on all types of Heltzel Highway Bins, for truck mixer charging, bulk cement plants, enclosed bucket elevators, belt conveyors, etc. Heltzel Steel Form & Iron Co., Warren, O.

Resurfacing Plants

15. Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

16. Moto-paver is a new type self-contained travelling asphalt plant having a capacity of 100 to 120 tons per hour. A novel spreading and laying device permits quick change to various road widths and crown conditions and thicknesses. Write Hetherington & Berner, 729 Kentucky Ave., Indianapolis 7, Ind. for Bulletin MP46 which gives full descriptions and specifications.

Concrete, Early Strength

38. 64-page manual tells how to speed concreting, to secure high early strength and greater workability at temperatures either below or above freezing. 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete, More Durable

50. How cement dispersion assures improved concrete with impressive economies in initial construction costs and maintenance costs. Manual from The Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI-PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses. 48-page booklet, No. 12. Armco Drainage Products Association, Middletown, Ohio.

Forms, Curb and Gutter

78. Curb and Gutter and Sidewalk Forms, including battered face curb form especially for modern traffic conditions. Heltzel Steel Form & Iron Co., Warren, O., will send booklets on request.

Generators

80. Two portable generators, one for AC and the other for DC current are described in new bulletin issued by Homelite Corp., Port Chester, N. Y. Commonly used for operating electrical equipment in planes, tanks and trucks, or to charge batteries or to supplement batteries for starting main engines, etc.

Graders, Patrol

98. The Austin-Western 99M Power Grader with its powerful all wheel drive handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow ploughing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Co., Aurora, Ill.

Joints, Expansion

102. Para-Plastic hot-poured rubber joint sealing compounds and Asphalt, Fibre, Cork, Cork-Rubber, Sponge Rubber and Waterstop expansion joints are described and illustrated. Write Servicised Products Corporation, 6051 W. 65th St., Chicago 38, for a copy.

Memorial Plaques

105. Enduring Bronze honor roll, war memorials, etc., for public places. For descriptive literature address C. H. Buck & Co., 99 Chauncey St., Boston, Mass.

106. Honor rolls, memorials, sculptured bas-reliefs, plaques, tablets, name plates and letters of bronze are illustrated and described in folder sent on request to Architectural Bronze & Aluminum Corp., 2342 W. Belmont Ave., Chicago 18, Ill.

Mud-Jack Method

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 illus. Write to The Barrett Div., 40 Rector St., New York 6, N. Y.

Piling, Steel

112. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., 1820 N. Central Ave., Chicago 39, Ill.

Pumps

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and de-

scribes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

Road Building and Maintenance

126. Two and Four Wheel Scrapers, Bulldozers, Tamping Rollers, Winches, Hoists and Repair Towers are subject of special bulletins issued by Gar Wood Industries, 7924 Riopelle St., Detroit 11, Mich.

128. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

130. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Write for folder, Huber Mfg. Co., Marion, Ohio.

Rollers

141. Three-Wheel and Tandem Rollers, 5 to 8-ton and 10 & 12 ton sizes: also variable weight tandem roller for new highway surfacing and old road conditioning. Huber Mfg. Co., Marion Ohio.

Soil Stabilization

150. "High-Service, Low Cost Roads" sets forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated, 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

152. Complete information dealing with Calcium Chloride Stabilized Roads. Contains many charts, tables and useful information. Write Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

154. "Soil Stabilization with Tarvia" — An illustrated booklet describing the steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Division, 40 Rector St., New York 6, N. Y.

Spreader

187. Mix-in Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers. Adjustable Spreaders, Forms, etc. — 4 complete catalogs in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Surface Consolidation and Maintenance

188. How sub-soils can be conditioned to resist softening and frost-action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit 26, Mich., for Bulletin No. 29.

Tractors

190. International Diesel Tractors are described and many uses mentioned in 48-page catalog. Write International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. *

Maintenance Equipment

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

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Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

354. Ice Prevention on Highways, Streets, and Airport Runways with Sterling "Auger Action" Rock Salt. An illustrated bulletin issued by International Salt Co., Inc., Scranton, Pa.

Sanitary Engineering

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia 42, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

Activation and Aeration

367. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability, 20 pp. illustrated. Sent on request to Norton Company, Worcester 6, Mass.

Bodies, Refuse

375. Gar Wood special bodies for sanitary refuse collection and for street sprinkling are illustrated and described in a new catalog issued by Gar Wood Industries, 7924 Riopelle St., Detroit, Mich.

Cleaning Sewers With Own Forces

385. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

386. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-

to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boulevard, Los Angeles 34, Calif.

387. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Three sizes of machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

Corrosion Resistant Metal

391. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. The American Brass Company, 25 Broadway, New York.

Diesel Engines

392. 20-page catalog describes "Diesel-electric" plants 3 to 10 KVA, and diesel engines from 4 to 12 H.P. These are easily transported and will produce reliable, low cost light and power anywhere. Write WITTE ENGINE WORKS, Division of Oil Well Supply Company, Kansas City 3, Mo.

393. Small Diesel engines—down to 3½ HP. The only stationary Diesel that is air-cooled. For full details on this revolutionary engine for municipal service write R. H. Sheppard Co., 150 Middle St., Hanover, Pa.

394. "Blue Streak" engines for 425 and 495 hp are described in Bulletin No. S 329; also Bulletins SA 341 and 342 for small and medium power service. Write Climax Engineering Co., 111 W. Monroe St., Chicago, Ill.

Feeders, Chlorine, Ammonia and Chemical

399. Feeders of all types including Hypochlorinators, Reagent Feeders, Dry Chemical Feeders, Chlorinators and Ammoniators for feeding all of the usual chemicals used in sanitation practice manufactured by Wallace & Tiernan Co., Newark 1, N. J.

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401. Gravimetric Feeder, Loss-in-weight type, measures and feeds dry or liquid materials by weight. Illustrated bulletin. Omega Machine Co., Inc., 96 Codding St., Providence 1, R. I.

Filters, Sludge

403. For bulletins on Vacuum Filters for dewatering primary, activated, digested or chemical sludge, write The Conkey Co., 420 Lexington Ave., New York 17, N. Y.

Fire Hydrants

405. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Anniston, Ala.

Flow Meters

409. The primary devices for flow measurement—the orifice, the pitot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (C42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

Gas Engines

411. For information on the use of Climax engines with sewage gas for developing power around the sewage plant write Climax Engineering Co., 111 W. Monroe St., Chicago, Ill.

Gas Holders

412. A 16-page bulletin gives detailed information on the development of corrosion—and how to combat it—in gas holders. A copy will be mailed on request to The Stacey Bros. Gas Construction Company, 5535 Vine St., Cincinnati 16, Ohio.

Gates, Valves, Hydrants

413. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

Generating Sets, Diesel

422. New booklet describes Sheppard Diesel Generating Sets that make low cost electricity from cheap fuel and give dependable service in the hands of any average operator. Write R. H. Sheppard Co., 250 Middle St., Hanover, Pa.

Laboratory Equipment

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet, W. A. Taylor & Co., 7301 York Road, Baltimore 4, Md.

Manhole Covers and Inlets

429. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul., and Indiana Ave., South Bend 23, Ind.

Meter Setting and Testing

431. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Meters, Venturi

432. New bulletin illustrates Builders Air Relay system for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. "The Selection of Main Line Meters," a highly informative and useful presentation, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Provident, Inc., 9 Codding St., Providence 1, R. I.

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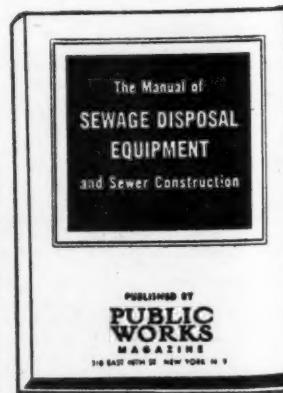
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Meters, Water

434. "Watchdog" water meters, made in standard capacities from 20 GPM up; frost-proof or split case in household sizes. All parts interchangeable with present models of same manufacturer. For bulletins, write Worthington-Gamon Meter Co., 282-296 South St., Newark, N. J.

Pipe, Cast Iron

435. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Pipe Forms

440. Making concrete pipe on the job to give employment at home is the subject of a booklet sent promptly on request by Quinn Wire & Iron Works, 1621 12th St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms.

Pipe Pusher

444. One-man-operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., 2042 Columbia Ave., Rockford, Ill.

453. Specialized pumps for sewage, sludge, water supply, circulation, condensation. Vertical, horizontal, centrifugal units. A separate bulletin for each type. Request bulletins by type of pump from Yeomans Brothers Company, 1425 North Dayton Street, Chicago 22, Illinois.

Pumps and Well Water Systems

454. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

455. Peerless deep well pumps in a variety of types, with oil or water lubrication and any power drive, to pump water from any depth. Write Peerless Pump Div., Food Machinery Corp., 301 W Ave. at 26th St., Los Angeles 31, Calif.

456. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

457. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Peerless Pump Div., Food Machinery Corp., Quincy, Ill.

Rubbish Collection

459. For saving trucks, labor, and time in city rubbish collection get details of the new Dumpster-Kolector described in literature just published by Dempster Brothers, Inc., Knoxville 17, Tenn.

Screens

460. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Sludge Drying and Incineration

463. Recuperator tubes made from Silicon Carbide and "Fireclay" Coreburners for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

Softening

467. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Swimming Pools

472. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

474. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination. Sent free to any operator requesting it.

Treatment

476. Are you familiar with the new, revolutionary "Rim-Drive" Clarifier? "Rim-Drive" eliminates costly mechanism and installation, and reduces maintenance costs. Write Yeomans Brothers Company, 1425 North Dayton Street, Chicago 22, Illinois, for the complete design details, capacities and installation illustrations.

477. The Yeomans "Package" Aerifier plant is especially designed for communities up to 3,000 population. This attractive, efficient plant, which features mechanically combined aeration and final clarification in a single tank, is described in Bulletin 6650. Write Yeomans Brothers Company, 1425 North Dayton Street, Chicago 22, Ill.

478. Carter Mechanical Mixing Equipment is described in bulletin #4501. Recently issued this catalog illustrates in detail, the various mechanical mixing mechanisms for water, sewage, and industrial waste treatment manufactured by the Ralph B. Carter Co., Hackensack, N. J.

480. Booklet No. 1642 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, installation pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

482. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

486. 28-page catalog describes and illustrates the Dorcco Hydro-Treator, a self-contained water treatment unit combining Flocculation, Sludge Thickening and Clarification. Reduces treatment time and lowers plant construction costs. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

488. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2438 Wolfram St., Chicago 18, Ill.

490. New bulletin fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Hardinge Company, Inc., York, Pa.

Water Treatment

496. "Use of copper sulphate in water treatment plants" contains valuable data on chemicals, dosage, etc. Ferri-floc Ferric Sulphate—a new, valuable booklet on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

Water Service Devices

506. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

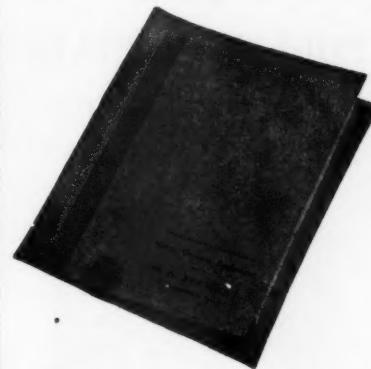
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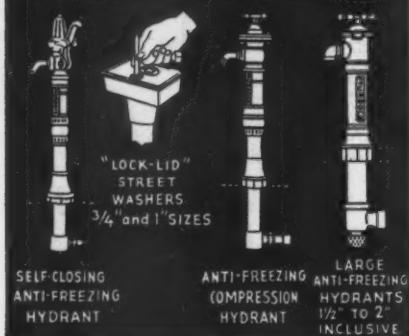
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American Water Works Association

Nominees for officers of the American Water Works Association are as follows: President, Wendell R. LaDue, Chief Engineer and Superintendent, Bureau of Water and Sewerage, Akron, Ohio; Vice-President, N. T. Veatch, Consulting Engineer, Kansas City, Mo.; for Treasurer, W. W. Brush, Editor of Water Works Engineering, N. Y.

Honorary membership was awarded by the Board of Directors to John R. Baylis, Engineer of Water Purification, Chicago; and E. G. Ritchie, formerly Chief Engineer of the Metropolitan Water District, Melbourne, Australia. The Diven medal will be awarded to James C. Harding, and the Goodell prize to C. Martin Riedel.

The 1946 convention will be held in St. Louis, Mo., May 6-10.

New England Sewage Works
Association

The Spring meeting of the New England Sewage Works Assn. will be held at Greenwich, Conn., May 17. Walter E. Merrill, 511 A. Slate House, Boston, Mass., is secretary.

Alden E. Stilson and Associates

Alden E. Stilson and Associates, Ltd., has opened a consulting engineering office at 630 East Broad St., Columbus, Ohio, for general practice in the fields of waste disposal, sewage treatment and water supply. Col. Stilson returned last Fall from the Pacific, where he served in Hawaii and on Okinawa. Associated with him will be T. W. Cadmus, formerly of Morse-Boulger Destruction Co.

Jobs Available for Engineers

Three or four men with some experience in refuse collection and disposal for duty as civilians in charge of this work in Army Service Command Headquarters. Starting salary about \$4300. Write Col. Hardenbergh, this magazine.

Draftsmen familiar with water works and sewage treatment design; also for heating, ventilating, and pumping facilities for water and sewage plants. Write H. H. Mace, at Alfred Le Feber, Consulting Sanitary Engineer, 731 Temple Bar Bldg., Cincinnati, Ohio.

Indiana State Board of Health, 3 or 4 Sanitary Engineers at \$325, four years experience required, some in responsible charge; also 3 or 4 at \$250 with at least 2 years experience. Write B. A. Poole, State Board of Health, Indianapolis, Ind.

East Cleveland, Ohio, Charles A. Curran, needs city engineering personnel, salary \$3000 to \$4800.

Norfolk, Va., H. H. George, III, Acting City Manager, needs a highly qualified city planning engineer. Salary to \$6000.

Ass't or Assoc. Prof. of San. Engineering, State College, Pullman, Washington, salary to \$3900. Write Prof. Emmett B. Moore.

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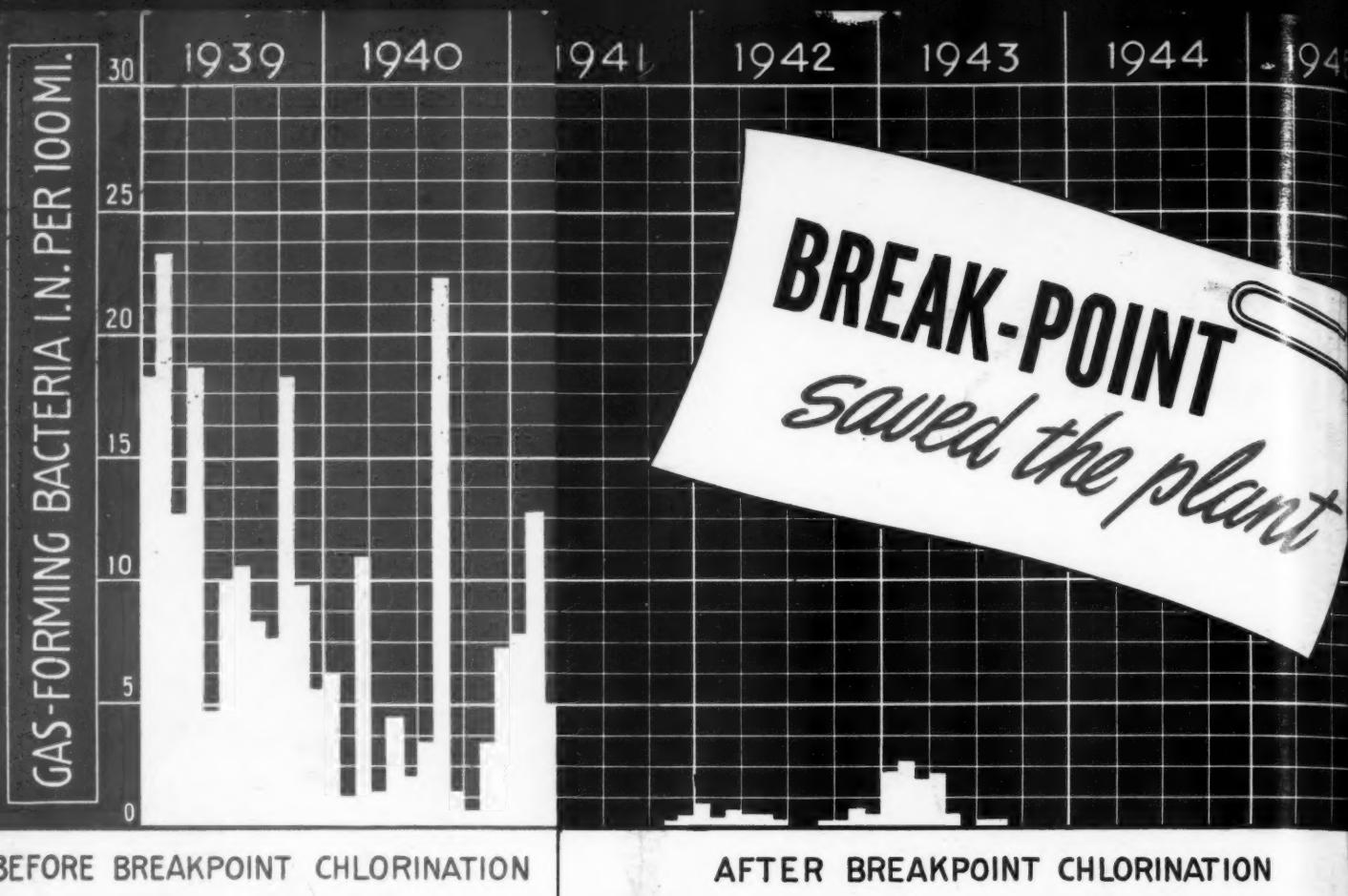
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Filtered	10.8	0.3	-97.2%
Finished	0.90	0.57	-36.6%
I. N. (Indicated Number) Gas-forming Organisms per 100 ml			
Raw	1769.3	2554.8	+44.3%
Settled	10.418	0.591	-94.3%
Filtered	0.697	0.047	-93.2%

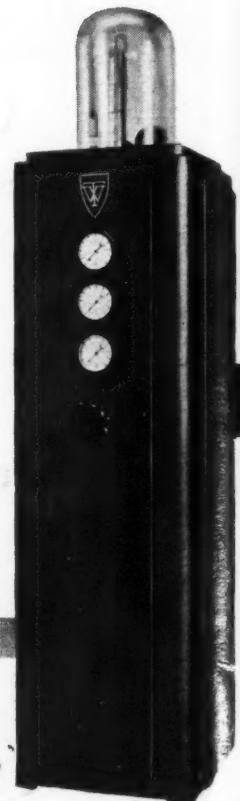


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